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September 1985

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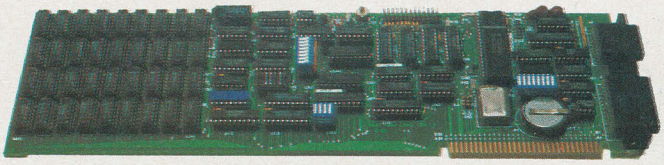

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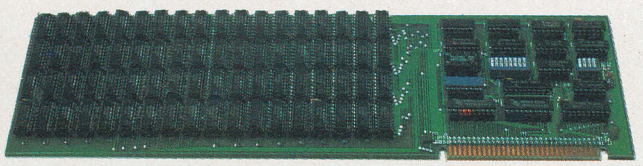

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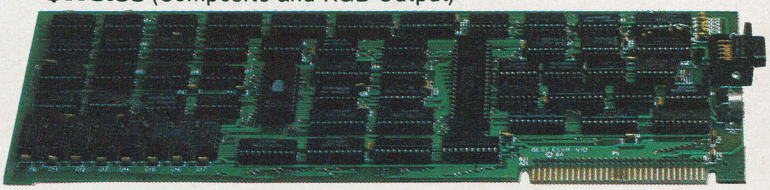

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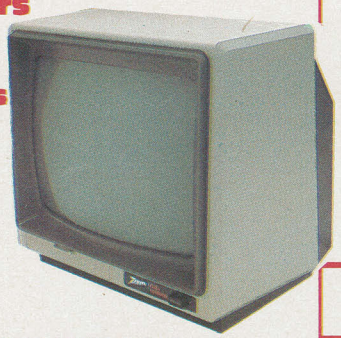

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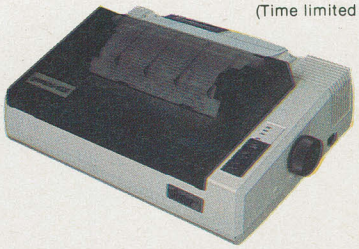

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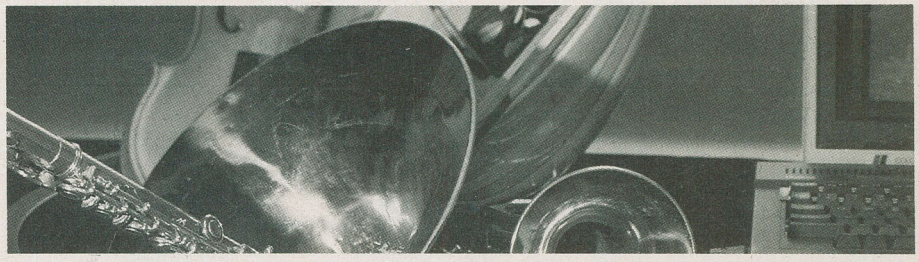

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A Look at the Commodore Amiga

For a few brief moments they let a select few humans sit in the presence of the latest Commodore computer... and it turned out to be awesome. Here are the details of this amazing new machine.

by Frank Lenk

One thing has to be pointed out at the very start. Commodore's new Amiga has a major design flaw which will seriously impair its usefulness to the average computer owner.

The flaw is that the control key has been positioned outboard... to the left of... the caps lock.

Aside from this glaring defect, however, the Amiga is as nearly perfect as human ingenuity and modern technology will allow. It's hard to believe. At last somebody has designed a microcomputer the way everybody knows it should be done. Every feature, every detail is just about the way you know it should have been long ago... but never was. The Amiga just might turn out to be that ultimate micro we keep hearing about, the one that will sweep everything else right off the desktop.

Truly, the Amiga has to be seen to be believed. Late in July, Commodore allowed a select few Canadians to experience the new machine. The chosen ones were ushered in small groups through a breathless introductory lecture... just long enough to turn skeptical squints into slack jawed looks of amazement.

Yes, the Amiga really is a remarkable system. As we all know, however, that doesn't exactly guarantee survival in the harsh and often unreasonable real world. What follows is only a first impression of what the machine can do. Whether it has the guts to realize its initial promise, only time will tell.

Just a Box of Rain

Physically, the Amiga is shockingly average. What one sees is the usual ivory coloured plastic... perhaps even a bit flimsier than usual. Then one notices the mouse straggling off to one side, and correctly infers... from the size of the slot on the front panel... that the machine prefers three and a half inch microfloppies.

It does indeed look... erroneously... like some sort of Macintosh clone.

Calling the Amiga a MacClone is absurd. This is an entirely original machine, brewed up from scratch and merely showing some superficial similarities to the Mac. The Amiga... in a great many ways... is the machine the Mac should have been. The Amiga belongs to an entirely different generation. To comprehend why this is so, you have to look under the skin.

The CPU itself is the trusty 68000... running at just under eight megaherz. However, this conventional processor is free to do a whole lot more processing, since virtually everything but raw number crunching and overall supervision is delegated to three custom VLSI chips designed by the same wizard who cooked up the custom chips for the Atari eight hundred series computers.

One chip handles static graphics and up to sixteen virtual sprites. Another deals with animation, through twenty-five DMA channels. The third does all the other I/O, including four channels of sound configured as two stereo channels.

The basic Amiga contains a quarter of a megabyte of RAM, making one suspect that some of its important design decisions were made back when RAM was not cheap. However, a cover plate on the front of the system box hides a little recess where you can swiftly stuff another quarter megabyte.

A second, smaller coverplate on the side of the machine reveals one of the Amiga's most winning features, a completely accessible system bus. There are no slots inside the box, but having access to the bus means there should be lots of peripherals available. For instance, coming almost immediately... from Tecmar... will be a twenty megabyte hard disk and a one megabyte RAM board. The Amiga can handle up to eight megs of RAM... and unlike the IBM PCs, might actually be able to use that much memory intelligently.

On the back of the box one finds the standard connectors sprouting in bountiful profusion. Starting on the left, there's the keyboard jack and a parallel port, programmable but defaulting to a Centronics mode. Next, there's a connector for extra floppy drives and an RS-232 serial port, programmable for speeds up to 31,250 baud and capable of driving a serial printer, a modem or a MIDI interface. Commodore will be supplying its own Hayes compatible twelve hundred baud modem, by the way.

Next over there are left and right RCA speaker jacks. Then there are the video outputs for RGB colour and a modulated composite signal for a television set or a video recorder. There's also a standard composite signal for regular monochrome and colour displays. The RGB port can hook up to an optional *Genlock*, which is used to syncronize an external video input with computer generated graphics. There'll also be a frame grabber, for capturing and digitizing NTSC video images.

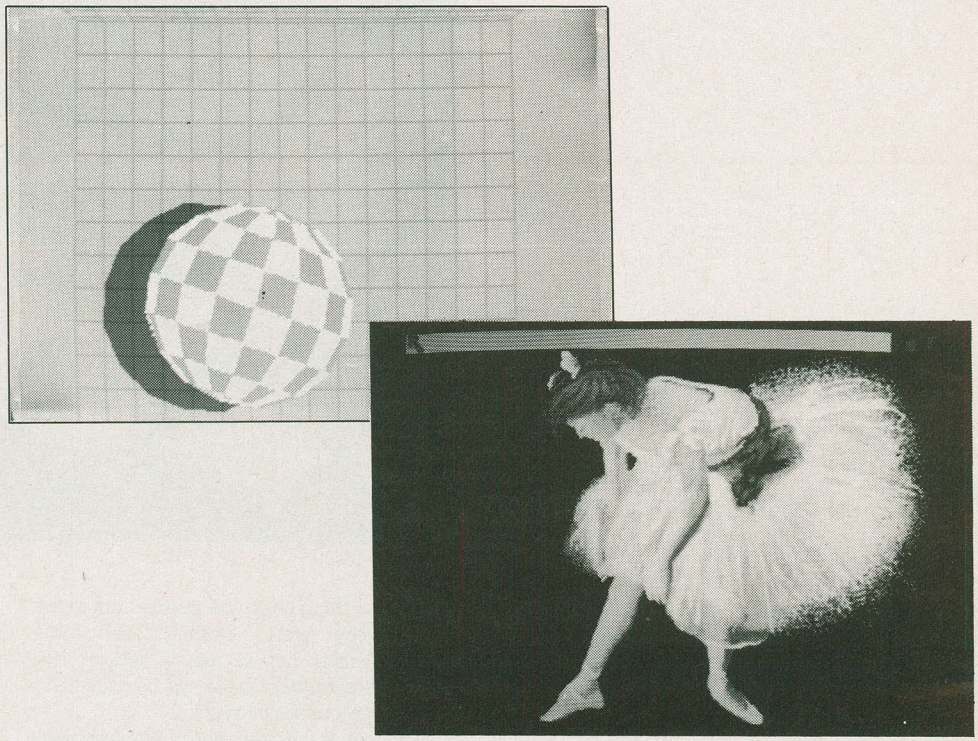
There are two identical mouse ports on the right hand side of the Amiga. Hooking up your faithful rodent will still leave one port free for digitizers, joysticks and other analog inputs. The Amiga uses a two button mouse.

The disk drive handles a roomy 880 kilobytes. You can add numerous external drives, including standard five and a quarters... of which I'll say more later.

in either mode can be doubled to four hundred lines by going into an interlaced mode. Theoretically this cuts the scan rate in half and brings on the possibility of image flicker... but there was certainly no flicker to be seen during Commodore's demo session.

Both modes use the same palette of four thousand and ninety-six colours. In the low resolution mode you can display thirty-two of these, while high resolution gets sixteen. However, you can also go to a "hold and modify" mode, based on the fact that these colour limitations really apply only to individual scan lines. You have only a limited number of colours per line, but a different set of colours can be enabled for each line on the screen.

The Amiga offers considerable display flexibility, apparently including the ability to locate the screen RAM wherever you like. The screen colours are vectored through a separate table, so any onscreen colour can be changed simply by altering a single memory location.



The Whole Picture

Of course, anybody looking at the Amiga for the first time is going to come away with one major, dominant impression. It's really good for graphics. It does graphics like you've never seen before, except perhaps on a hundred thousand dollar dedicated system. The Amiga's two main modes are low resolution, with three hundred and twenty by two hundred pixels and high resolution, with six hundred and twenty by two hundred pixels. The vertical resolution

These specifications are good, but not exactly mind boggling. Similarly, the Amiga's still graphics are posh, but not that far ahead of things like the PC's new enhanced display adapter. It's only when you see all those pixels in motion that you get some feel for the potential of the Amiga.

Commodore used several demos to show off Amiga animation. One machine parked in the corner spent all of its time displaying a solid shaded block rotating around a skewed axis, with the 'Amiga' logo

floating, rotating and changing colour in front of one face of the block. The other demo consisted of a large red and white checkered ball that bounced and rotated in front of a static grid. Every bounce of the ball was accompanied by a ridiculous hollow bashing sound that apparently was created by one of the Amiga's designers by digitizing the sound of his garage door being hit with a baseball bat. It sounded strange, but appropriate.

Another good one involved a moderately demented street scene used as a static backdrop. Silly animated characters strode across it in convincing motion. The interesting thing is that this was done without sprites. Instead, the DMA chip is used to shuffle predefined chunks of screen memory around.

One of the most bizarre... but also the most useful... tricks the Amiga can do is to take an entire screenful of graphics and slide it away like a curtain, revealing the command screen underneath. This apparently involves yet another level of manipulation of the screen information, separate from the regular windowing. In the demo session the operator pulled several three dimensional business graphics up from disk, and then expanded all of them to nearly the full screen size. He then slid the whole conglomeration off the screen as easily as a PC might scroll text, the difference being that the Amiga screen could be pulled back again.

Aside from the Amiga's graphics, there's the delicate matter of text. As on the Mac, everything on the Amiga is bit mapped. The standard text display is eighty columns by twenty–five lines, with an alternate sixty column mode available for television sets. However, the system also supports various font styles, such as underlining, italic, boldface and even proportional print. Imagine something like MacWrite, running much faster, and with real disk storage available.

Kick it Over

The hardware of the Amiga is quite spectacular. Its firmware operating system is equally so. Actually, it's not all that firm at the moment. The Amigas being shown so far have their operating system, the *Kickstart* package, supplied on disk. When the machine is powered up it displays a suggestive drawing of a hand shoving a disk into the drive. Kickstart loads into a special quarter megabyte block of RAM, which is then protected so heavily that it takes five minutes with the power off to clear it.

Apparently Commodore is hedging its bets and assuming that there will be some modifications before the operating system eventually gets burned into ROMs. So far, Kickstart contains a hundred and twenty thousand lines of source code, mostly in a high level language.

After Kickstarting, you are once more prompted to insert a disk... this time, the *Workbench*. This seems to contain both Amiga DOS, created by MetacompCo, of Bristol, England, and the window management system, known as *Intuition*. Workbench provides a user interface much like that on the Macintosh or the Atari ST. The Workbench is a bit more colourful, however. For instance, the mouse pointer arrow comes up in a highly visible shade of orange. The disk directory windows add a vertical orange "fuel gauge" bar down the left side, showing the remaining file space. Pull down menus support a two level structure, whereby a menu selection could produce a second pull down next to the first, containing secondary options.

The overall screen backdrop defaults to deep blue, but everything is user configurable.

Unlike either the Mac or the ST, the Amiga let's you switch the whole windowing circus off and drop down to an MS–DOS

style command line interface. From here you interact directly with Amiga DOS. This monster supplies essentials such as hierarchical filing in directories and subdirectories, synchronous and asynchronous I/O and device independent I/O. Like MS-DOS... but very much unlike the Mac's Finder system... Amiga DOS is designed to simplify installation of driver programs such as RAM disks.

Since Amiga DOS embodies true multitasking capability, Amiga windows represent something more than just cute imagery. On the Mac, all windows on the screen must relate to various aspects of a single software process. On the Amiga you could have BASIC going in one window, a graphic display in another, a word processor in a third... all running at one time. Commodore claims to have run over fifty windows at once, though of course things can slow down a bit at that point.

Still, Commodore did demonstrate a handful of separate BASIC programs, all running graphics in separate windows with absolutely no visible slowdown, and apparently without using more than about ten percent of the processor's capacity.

The combination of the 68000 and the extra I/O chips certainly makes multitasking a much more realistic proposition on the Amiga than on the IBM PC or even the AT. Amiga DOS sees to it that multiple applications can all behave as though they had the 68000 all to themselves.

Soft in the Head

There appears to be a staggering selection software ready to roll concurrently with the machine's official introduction this fall. The list already looks more promising than that for the Atari ST, which has been available for some months now.

The coming selection looks unbelievably complete. It includes the Amiga assembler and linker, Amiga BASIC and Amiga Lisp... all from MetacompCo... as well as Lattice C. Microsoft will have its own ABasiC. The Lisp Company will offer TLC LOGO. Turbo Pascal is promised for the first quarter of next year.

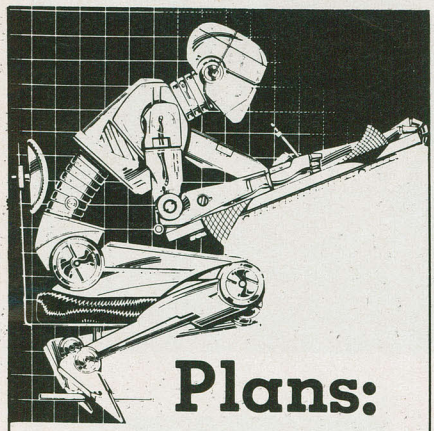
Textcraft, a word processor from Arktronics Corporation, is due upon Amiga's debut. There'll be accounting stuff from Chang Labs, to be available this fall. The Software Group is bringing on Enable/Calc, Enable/Write and more.

There'll be a slew of music software from Cherry Lane Technologies, and Everyware Incorporated. There'll be several graphics packages, including Graphicraft, a low end affair, and Graphicraft Pro, the full fledged package, from Island Graphics. There'll also be several animation packages, from Island and others.

Inevitably, there'll be games galore, everything from the ubiquitous Infocom adventures to a totally new flight simulator from SubLogic to Marble Madness from Electronic Arts. The latter company has gone particularly Amiga mad, and expects to have Amiga versions of several of its existing games, including One on One, Archon, Return to Atlantis, Seven Cities of Gold and Skyfox. Hayden should have its Sargon III ported over by early next year.

This by no means exhausts the list of product announcements distributed by Commodore.

Then there's the wildest announcement of all. The Amiga will also be... would you believe... PC-DOS compatible. No fooling. Commodore actually demonstrated a software emulator that lets you plug a genuine original PC disk into the optional five and a



Plans:

System:	**Amiga**
Manufacturer:	**Commodore**
Processor:	**68000**
Memory:	**256K expandable**
Storage:	**3.5 inch, 880K miniflop-pies, 360K 5 1/4 inch optional.**
Operating system:	**Amiga DOS, PC-DOS optional**
Display:	**4096 colours, 620 x 200 pixels**
Price:	**About $2000 Canadian**

quarter inch floppy drive. Lotus came up as nice as you please.

This is not quite something for nothing. Loaded down, the Amiga could run as much as seventy percent slower than a PC with comparable software. However, Commodore has that one figured out as well. Since most of the execution overhead involves simply translating 8088 instructions, the bottleneck can be opened up by putting the lookup table into very fast static RAM. This should let the Amiga run PC-DOS at pretty much exactly PC speeds. The software emulator and the accellerator board will go for about a hundred and fifty dollars each... a small price to pay. The emulator does require a half megabyte of RAM, although almost four hundred kilobytes are left available for program space.

The demonstration version of the emulator had no graphics capability, but Commodore promises that that's coming. The Amiga, they promise, will easily run the SubLogic Flight Simulator, the traditional test of PC compatibility. However, Commodore also points out that actually running the simulator would be pointless, since far better Amiga specific software is already on the way.

The Catch

The Amiga seems far too good to be true. It costs less than two thousand dollars Canadian for a basic system... ascending to three thousand for a half megabyte of memory, two drives and a colour monitor. It sort of takes your breath away.

The software, the operating system and the company behind the Amiga all seem to fare well under close scrutiny. One might well ask whether, as sophisticated as it is, whether the Amiga will survive against a well rooted PC market. This is important, of course, not just to Commodore but also for anyone who plans to buy one of the early Amiga systems. One can only look for continuing support and development if one owns a successful computer.

I'll buy one if you will... but I wish they'd fix that keyboard. **CN!**

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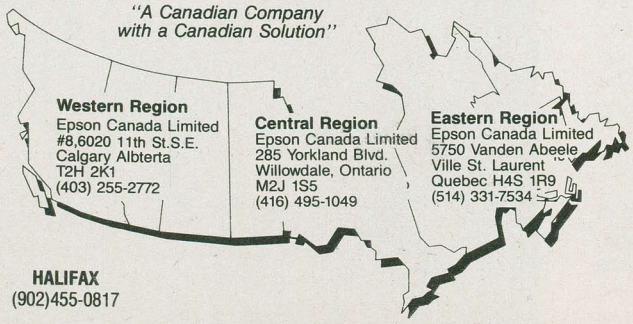

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Circle No. 43 on Reader Service Card.

COMPUTER PRESS

by Marie Hubbs

ComputerLand Canada has introduced a nationwide, toll-free hotline service to answer customers' software questions. The bilingual service, operating between 8am and 8pm Eastern time, will have software specialists available to answer questions on a list of some thirty to thirty-five selected packages. Customers can use the hotline for the duration of each maintenance contract purchased, or for up to thirty days with each software purchase. Participating ComputerLand stores will automatically register their customers.

ComputerLand Canada is located at 2000 Clark Boulevard, Brampton, Ontario, L6T 4M7; or call Deborah Rolls, Media Relations, telephone (416) 793-9000.

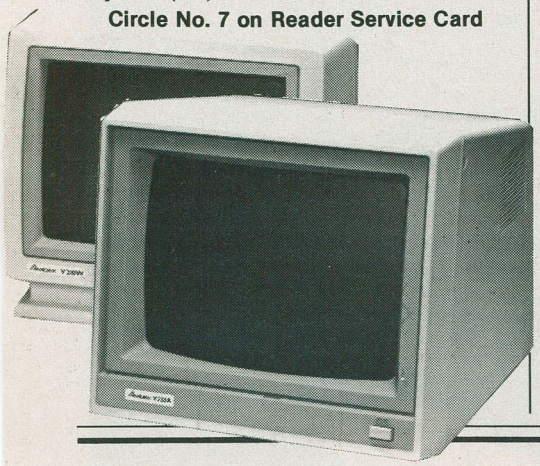
Circle No. 6 on Reader Service Card

Tubes

Two new monitors are available from *Amdek*. The 12 inch V232 IBM PC TTL compatible monochrome, available in green or amber phoshpor, retails for under $220 Canadian. The 9 inch V210 comes in green, amber or white phosphor and sells for under $190.00 Canadian.

For more information, contact Amdek Electronics Canada, 1515 Matheson Boulevard, Mississauga, Ontario, L4W 2P5, telephone (416) 625-1144.

Circle No. 7 on Reader Service Card



A Canadian software and computer services company, *The Inevitable Corporation*, announced that it is making its telecomputing service available across Canada. Available locally in Montreal for the past two years, The Access Timesharing System offers electronic mail, conferencing, bulletin boards, opinion polls and public databanks, as well as numerous entertainment features. President of The Inevitable Corporation, Timothy Campbell, feels the service is especially attractive because of its low cost, less than six dollars per connect hour across Canada, and because the "electronic office" service allows businesses to conduct various office communications functions regardless of geographical separation.

Additional information is available from Neil Baron, at (514) 342-8147, or by writing the company at 8400 Cote de Liesse, Suite 217, St. Laurent, Quebec, H4T 1G7.

Circle No. 9 on Reader Service Card

The University of Waterloo has embarked on a twenty million dollar project to create a wireless network to connect laptop computers, with an expected implementation date of 1990. By this date, it is believed that the network will be able to spread throughout the province by way of cellular radio communication. One of several major companies to provide services for the project is Northern Telecom, and up to ten hardware manufacturers will be supplying the portable computers. The computers used will be between four and ten pounds, be battery driven, have video output and graphics, and will operate on IBM PC-DOS.

As well as the design and testing of the necessary hard and software, and related technical problems such as traffic control, and the potential loss information, interrelated research will also study the portable's feasibility as a tool of creativity and production, as well as the impact of the computers themselves on the users, how work habits, communication style, and even lifestyles are affected.

Crusty Payrolls

Genamation recently announced the availabili ty of **The Payroll Machine**, a Canadian payroll system developed by *Classic Software*, Barrie, Ontario, and supported on a Toshiba T-300. Handling up to five thousand salaried or hourly employees, The Payroll Machine provides tax-reporting, year end T-4s, UIC separation slips, and labour distribution by department, as well as such accounting applications as inventory, job costing, general ledger, and accounts receivable/payable.

The total cost of The Payroll Machine and Toshiba T-300 is approximately six thousand dollars Canadian, and includes a monochrome monitor, 256KB of RAM, two 640KB floppy disk drives and one 10 MB hard disk drive.

Genamation Incorporated is located at 351 Steelcase Road West, Markham, Ontario, L4R 3W1, telephone (416) 475-9434.

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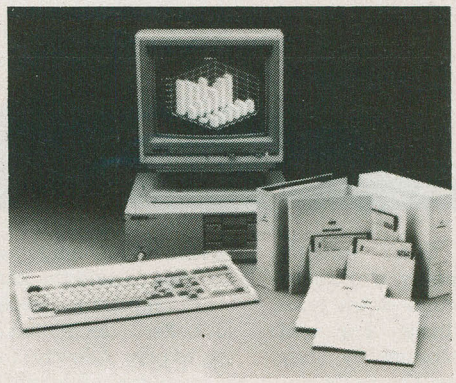


continued on page 67

Next Month In

Computing Now!

All the Print That's Fit to be News

In the next edition of Computing Now! we'll be checking out printers, those noble slaves of personal and business computer users alike. Among the things we'll be looking at will be a complete survey and buyer's guide of printers from all walks of life . . . except, of course, that printers don't walk. There will also be reviews of some of the hottest new printers. Your paper will never be the same.

Typesetting for Printer Owners

If you're about to sit down to generate a report . . . or a club newsletter . . . or a flyer . . . or just about anything you want to look visually slick, you may well be warming up your dot matrix printer and your fancy font generator. In the next edition of Computing Now! we're going to look at the rational of designing pages so they look attractive . . . as opposed to the "typesetter's acid trip" effect so many people manage . . . and we're going to look at commercial online typesetting as a cheap and infinitely more professional alternative to a printer.

Simple Business Computer Security

Security measures to keep people you don't like out of your system often succeed in keeping out people you do like too. Placing the keyboard in a tank full of live cobras is one solution to the problem, of course, but one can also solve it with this simple approach. We'll check it out next month.

TimeBomb for the IBM PC

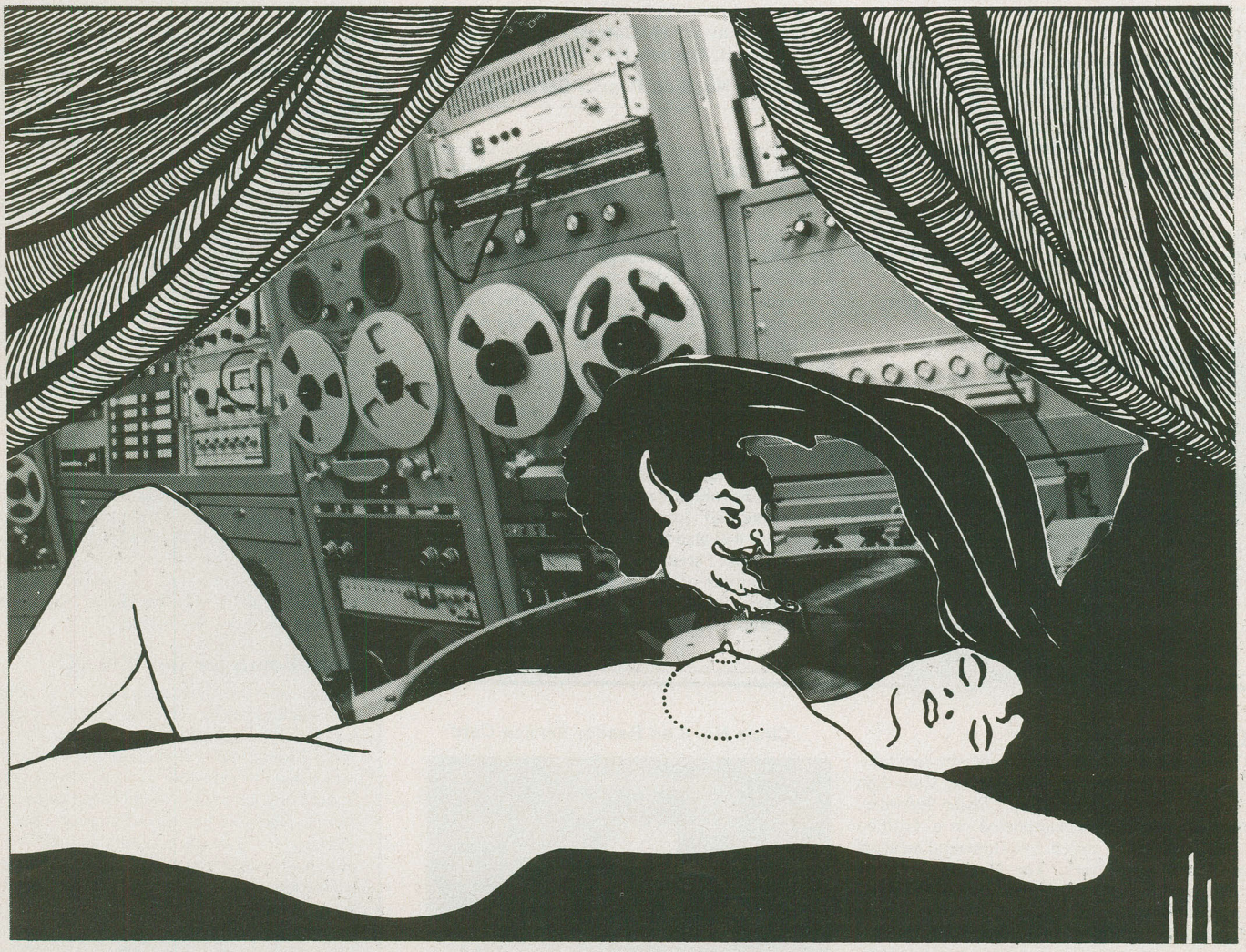
People who use their computers a lot often lose track of reality. The phone will ring and suddenly you'll notice that it's winter. You've missed seven months worth of appointments and there are probably enough newspapers in front of your house to build a life size papier mache model of the planet of your choice. TimeBomb is a simple program that will beep at you whenever you want to be reminded of something . . . even if you're in the middle of an application.

These articles are in an advanced state of preparation and unless Horatio the office cat eats them they will appear next month. However, cats are unpredictable creatures and, as such, we reserve the right to alter the final contents of the issue prior to its going to press.

Welcome to my Nightmare

The gulf between buying some computer music hardware and actually creating music you wouldn't be embarrassed to play for your cat is gaping and bottomless. Here's a look at one run for the nearest bridge.

by Steve Rimmer



Personal studios don't exactly happen... not unless you're really loaded and can cruise down town with a van to just buy things. For most humans, they evolve. Unfortunately, they have to do a lot of evolving before they're much use. If the first stage of evolution is, say a mixing board, you're not going to be able to do anything much for about another six trips around the karmic wheel.

Computer music can be a lot worse or a lot better... depending on what you are going to play. Allowing that you already have a computer of the right sort you can get into some hardware for less than a grand. You can also get into some hardware for a lot

more than a grand, as the articles in this issue probably suggest.

The latest MIDI toys expand the possibilities for playing your own stuff all by yourself enormously. You can be your own orchestra and have absolute control over what goes down. You can do a lot with older stuff, too, but I confess to having become very enamoured with the state of the art.

There are a lot of heads who seem to have ten or twenty grand to go out and blow on MIDI toys. My theory is that they've all managed to get government grants in ways that you or I would never think of. I haven't got enough money to pay the income tax on what they seem to spend. As such, my studio... and what I can do in it... is a bit more within the reach of actual humans with actual stomachs that actually need feeding on a regular basis.

This article will deal with some of the techniques which are available to one with a modest computer music studio.

Jack Straw from Wichitaw

Like I said, what you need is dependent on what you want to play. Aside from self indulgent twenty minute orgies of neo-classical pig Latin... which are enormously fun and can sound pretty impressive... I find myself doing occasional film score style music. Most of the actual songs that I record are done with more conventional instruments, like guitars and stuff... the computers are good for effects, but not really for the basis of the songs themselves.

Yes, I know, this is retrograde thinking and all but, hey, my hands still experience convulsive plug ripping spasms when Duran Duran comes on the box.

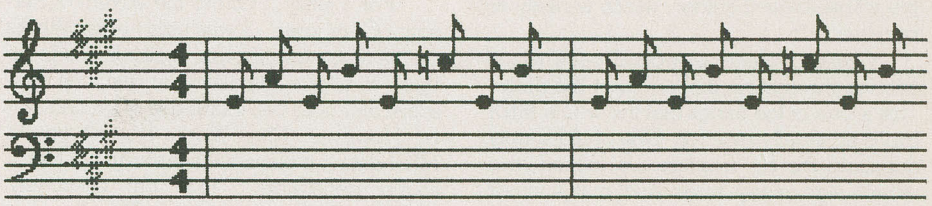
Neo-classical self indulgence doesn't really take any great degree of technique... nothing you could hang an article on... and, as such, I'm going to concern myself with a film score in this article. This isn't a real film score, because if you crammed all the effects and things I want to talk about into one twenty minute documentary sound track it would sound really wretched... a bit like Duran Duran, actually.

This piece, then, is a composite of several film scores. It should never actually be played.

There are two fairly good ways to get into a film score. Actually, there are a lot of ways... these are just two that you come across a lot. The first one is a kind of Rick Wakeman style drone that builds up into something. The other is a Mike Oldfield pattern that degenerates later on. Documentary films tend to be pretty busy when they first get going, which makes the second approach nominally better.

The traditional visual beginning of one of these things is a lot of images that last for about thirty frames each. Pattern music seems to suit them.

This, then, is the opening gambit, the pattern which will form the basis of the piece.



Now, there are a lot of ways to get this going... but I'm lazy and would rather let the computer do it. I'll play it on the DX-7... a MIDI keyboard... into the IBM PC running Personal Composer. I was using the Roland MPU-401 support software before Personal Composer came along. It works well too, although it's nowhere near as powerful.

Drums Along the Conga

At this point I have to figure out whether I want percussion in there and, if I do, how I'm going to get it in. Rich people have MIDI drum machines... but I'm not rich, and have to get by with more primitive hardware. The synthetic percussion toys I have available can't synchronize to a MIDI track, so they have to go down first if they're going to go down at all.

This is where the dichotomy between what MIDI can do and what I can afford to make MIDI do becomes agonizingly apparent. Guys with lots of MIDI noise makers will play all the tracks into the computer one at a time and play them all back through their hardware whilst meddling with the voices... essentially playing with the mix in real time. As it is, I'm going to have to play the stuff to tape well before the ultimate mix down.

I can actually make the Apple into a MIDI drum machine by using the Roland Compu-Music. This isn't bad, but it has a very limited number of drum sounds. It works for pop... but not too well for film scores. A drum machine is next on the list.

Tape, as opposed to computer memory, is fairly wild and it's extremely difficult to syncronize multiple music tracks. It's not difficult to add tracks to an existing tape in real time... straight up overdubs, really... so a lot of this stuff will be done like old style acoustic recording.

In playing with DX-Pro... rambled on about elsewhere in this book... I managed to create voices which turned the DX-7 into a fairly good percussive box. There's a lot to be said for doing this... you get much better voices and a much wider range of potential noises than you would with, say, a Drumulator. A TX-7... that's a DX-7 with no keyboard... might prove to be a more productive acquisition.

I've also meant to try using the Yamaha CX5M in this way. We checked this out in the August 1984 edition of Computing Now!. As far as the MIDI bus is concerned, the CX5M is a DX-9 voice module, and quite capable of doing percussive noises.

The other approach is to put a click track down on the tape to begin with... just a steady rhythm to synchronize everything with by ear, like a metronome... and then put in acoustic percussion. I lean toward this because acoustic percussion sounds a lot better than even really good electric stuff.

One of the best things I've gotten into in neo-classical self indulgences... and, to a lesser extent these more serious things... is a fusion of computer noises and acoustic noises. This can be extremely pleasing... you can play off the compositional complexity and precision of the computer with the acoustic complexity and human-ness of real instruments. This is a reasonably good argument for doing the percussion with real drums.

Concerto in E Splat

With the pattern happily chiming away... and the drums discussed into the ground... we can start getting into some additional tracks. This really starts becoming a Mike Oldfield trip after a while. It's really decent with Personal Composer, which lets the MIDI switch voices.

One of the first stages in all of this is usually to spend a while with DX-Pro creating a performance group of voices that will do what I want it to do. There's an article about DX-Pro in this issue as well. The Personal Composer package might play for, say, four bars and then change the voice that the DX-7 is playing for the next four bars. However, this necessitates having all the voices that one will want in a piece in the DX-7 at one time.

Personal Composer is slick, but it can't pull out the ROM packs for you.

DX-Pro lets one take voices from an assortment of libraries and arrange them into a group such that all the ones that are required for a piece can be loaded into the DX-7 at once. This process is a bit laborious, but, having been done once it's usually the case that future pieces require only moderate variations on one's pet libraries.

I regard the pattern piece as a *ground* and the additional tracks that get zapped over it as *figures*. Now, how one manipulates these two elements really determines where the piece is going to go. A completely unchanging ground track is a lit-

tle boring. One which goes leaping off into another cosmic dimension every sixteen bars is extremely distracting, and fails to tie the whole affair together, which is really its purpose.

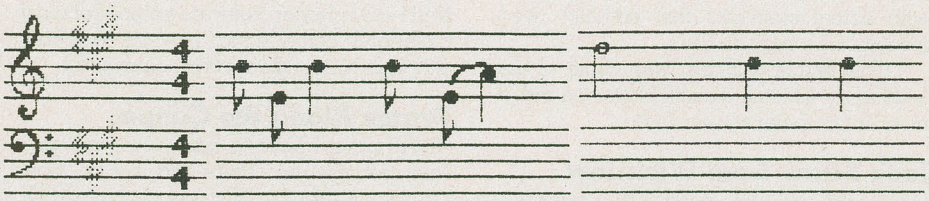
One can create a ground track which evolves throughout the length of the piece. This is one of the things that the whole MIDI trip is especially nice for. One could simply duplicate the bit of score we looked at a minute ago many times and make minor changes to it as it's being repeatedly copied.

Another approach... and another common device in Mike Oldfield records... is to have the ground suddenly disappear and the figure replace it, to be in turn replaced with another figure track several bars later. The usual prelude to this is that the figure track starts getting a bit repetitive. This is a really nice effect if you can pull it off well. In a film score it should, ideally, occur at the same instant that the film does some sort of noticeable change.

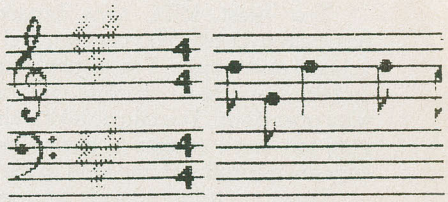
The real fun in doing a piece like this is in doing the figures. There are people who have their chops a lot more together than do I and can sit in front of Personal Composer and just write these things as sheet music without really having to hear them. I usually let the ground track play and experiment a lot, keeping the bits that work. In more complex sections of music, this amounts to finding something I like, having several tries at it and then finally fixing the last few glitches on the screen of the PC.

For a while... before the advent of Personal Composer... I was using MusicWorks on the Macintosh for this. It allows one to do these sorts of manipulation in real time on a score and hear one's stuff sort of immediately. However, MusicWorks doesn't create MIDI data... it plays back through the Mac's sound generators... nice but effectively useless... and prints scores. Still, it was a convenient way to play. The scores in this piece were done by MusicWorks as the printer cable for my PC is currently fried.

This, then, is a typical figure track for the ground I'm using here.

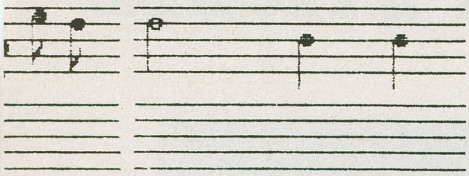


This thing is good for several bars. It sounds really good if you introduce variations on it periodically. A fairly safe sort of dogma to lay on it is to have it generally ascending or descending over the space of sixteen bars, for example. A second variation might be this.



One can also do a lot with timbral variations. Playing the same bit of figure over and over again while changing the voice the DX-7 is using can get a lot of mileage out of one fragment of music. That sounds very crude, I know. One of the recent toys I've started playing with is a Roland digital delay... also found elsewhere in this magazine. This thing can lay echo, flanging, automatic double tracking and so forth on some sound all under MIDI control, so one

can have the PC switch it on and off and change its modes in the same way as one would have it punch in new voices on the DX–7.



This is a bit dangerous. You can start out with something that sounds like Bach and wind up with something that sounds like Larry Fast on a bender.

Mixdown and Out

As I've been getting better MIDI facilities together I've been able to use them for more and more of the recording process. In really primitive times... a few months ago... all of this might have gone live to tape. I'm presently at the stage where... if the piece happens to suit the hardware I can bring to bear on it... I can mix down a lot of the stuff in the computer. This is really glorious. I can play back MIDI tracks through the DX–7 or the DX–9 module in the CX5M and experiment with the voices. Hmmm.... I think that that cello track might sound good as a bass soon. Let's try that...

And so it goes.

With advent of Personal Composer I've been able to get really slick, just sticking in long rests in the score where I want to punch in an acoustic bit in the final mix.

With all the MIDI based things done I can dub this to tape. I have four tracks on the tape and, in most cases this will mean two for the MIDI, one for the acoustic percussion track if there is one and one more for any acoustic music tracks that are going to get stuck in there.

The tape will get mixed down to a cassette most of the time... the half track machine's been broken since 1983 and, as no one seems to want half track masters any more I haven't gotten around to fixing it. This is understandable for film scores that are going to get dubbed onto sixteen millimeter film. The sound quality of a cassette is no glory, but it's a lot quieter than an optical sound track on film.

In addition, of course, the four track is effectively a quarter track recorder... four tracks on quarter inch tape... so mixing it all down onto a half track is a bit pretentious. I don't really care about the track widths... the thing is fairly quiet.

Film score type pieces are about the easiest thing to explain in the context of a personal studio... I don't actually spend all that much time involved with them. Neo–classical self indulgences are eminently more fun. Chances are that your tunes won't be anything like either of these things... the real party of computer music is the time you spend growing into it.

The cat will freak, of course, but then cats have such abyssmal taste. **CN!**

Some of The Denizens of my Nightmare

Beginning with the first picture, at the far right there are two wooden nineteen inch equipment boxes. These hold a lot of fairly funky home made stuff, some of which works if it isn't Tuesday. Starting at the top there's a dynamic noise reduction thing, the last project I ever designed for Electronics Today. It's rarely used, as I don't have that much of a noise problem.

Below this there's a patch bay. It's full now, which means that I'm going to have to wire another one soon. I dread this. Wiring patch bays is a lot like weaving a blanket out of live rattlesnakes. Next on down there's an eight channel stereo mixer and headphone amplifier for checking out the tracks while they're being overdubbed. Finally, there's a phasor that's pretty quiet if you don't turn it on.

The mixing board on the table is a Teac model two. It's actually pretty good as slightly ancient mixing boards go.

The tape recorder is a Fostex 4A... also a slight dinosaur. It works well and has a fine pitch control, something the Tascams of its day lacked. Anyone knowing the whereabouts of a cheap Dolby unit for this thing is invited to contact the editor. The Apple clone runs DX-Pro, for the most part. the most part.

Turning now to the second picture... at the side of the room where there isn't all that much light... we find that the keyboards have been breeding during the dark hours. The one on the right is a Yamaha DX-7 in all its splendor. The bottom of the two on the left is a Classic organ sound system... a kind of combination Alpha Syntauri and Sound Chaser for the Apple. There's another Apple compatible computer to the left of them. You can't see it in the picture, but if you've seen one Apple...

The top keyboard is a Yamaha YK-10, which is hooked to the CX5M immediately on top of it.

The tape recorder is a really scuzzed out Revox on which almost everything has died at one time or another. It might be time to make a lamp out of it.

The Yamaha DX-7 and Friends

The dean of computer music systems, and more fun than a live aardvark at a board meeting of Dow Corning, the DX-7 is the finest thing to happen to music since the invention of sound.

by Steve Rimmer

Computer music must, by its very essence, have two elements at least... a computer and something to emit music. The computers have never really been that much of a problem... there have generally seemed to be quite a few kicking around. The music part of the performance, however, has always been a bit slack.

This isn't really that hard to understand. Until quite recently, electronics... even really tight electronics... couldn't do anything like what you could get out of an authentic horn or a hand full of strings and a few slabs of wood. Old technology could out play fiberglass every time.

This has changed a lot in the past few years. Synthesizers are a lot more than funny looking pianos, and you can get some pretty wild sounds out of them. In fact, given the right synthesizer you can play a keyboard... or write a program... that will sound almost indistinguishable from any of a huge range of instruments.

Not surprisingly, these most sophisticated of electronic instruments have microprocessor technology within them.

Perhaps the most sophisticated and widely accepted of all of the contemporary computer music boxes is the Yamaha DX-7... yes, I know, it had to be something like that or I'd have hardly mentioned it in the title of the article. In fact, the DX-7 is a bit of a Swiss army knife, being several things in one box. However, when it's plugged into any of several computers it becomes half of some of the most fiendish computer music power on the planet.

It's the keyboard to have even if you can't play keyboards to save your life.

The Long DX

The DX-7 is actually one of several relatively similar Yamaha keyboards. It's hard to say why it seems to be more universally splendid than its relations. However, it slides right into a computer music system like it had eyes.

The basis of the DX-7 is a bunch of hardware and firmware which Yamaha describes as *algorythmic FM synthesis.* This, in itself, is a bit of a party and is really what the music part of the DX-7 is all about.

Actually synthesizing music electronically... that is, creating noises that sound like they might have come from real instruments... is fraught with amazing difficulty. A note from a trumpet or a chord on a piano can be the most complicated of things. There are enough parameters in there to keep the algebra freaks happy for months.

Aside from the basic pitch of a note and the shape of its envelope, there is the note's timbre, or its harmonic content, to consider. This is generally handled under a simple Moog type synthesizer by taking one of several simple waveforms... a square wave, a sawtooth and so on... and filtering out the harmonics that one doesn't want in the finished sound. In practice this isn't really workable to get extremely natural sounds, however, because natural sounds rarely come with a reasonable and predictable harmonic structure.

In addition, the pitch of a note, its harmonics and its envelope all vary over the duration of the sound... quite a lot. As such, just heaving in a few envelope generators is rarely enough.

The synthesizer which forms the heart of the DX-7 is actually able to manipulate sound with enough finesse to handle authentic acoustic noises. However, this is only one of the tricky parts. It also contains a useable set of rules which allow humans to control it without having to write it programs every time it's supposed to change voices.

Given the internal controls that the DX-7 has to play with, there are six func-

tional parameters that one has to deal with. These are referred to by the manual as the thing's *operators*. An operator is an envelope generator with an input for a pitch oscillator and a modulation data source of some kind. This can get a bit complex because the input to an operator is very often another operator or even the output of the operator in question itself.

This last bit is one of the things which serves to make the *algorythms* of the DX–7... the maps of the various ways the six operators can be conceptually plugged together... look a bit complex. You might want to check out some of the algorythms in this article to check out what's happening.

When two sine waves are combined in an operator a harmonic spectrum results. By manipulating the way the operators are plugged together virtually any set of harmonics can be generated.

While there are thousands of permutations for the six operators, Yamaha has elected to make only thirty–two combinations available on the DX–7. In fact, while most of the potential combinations would produce sound, a lot of the omitted ones are redundant and some are essentially useless. It's fair to say that the thirty–two combinations are capable of making the DX–7 do everything it could ever be asked to sing with.

It's incorrect to think of the operators as being modules, as one thinks of the oscillators and amplifiers of a conventional Moog type synthesizer. For one thing, the two systems of synthesis are the exact opposite of one another, the DX–7 being additive and the Moog being subtractive. More than this, however, the two approaches are conceptually different, and it'll do your head if you try to conceptualize the working of the DX–7 in the terms of an older style instrument.

In all fairness, it takes at least a couple weeks of thought and toodling to really get fluent with the workings of the operators and their algorythms. On top of this, there are some Moog style parameters still in the machine, like a low frequency oscillator, pitch bend and so forth. However, being digital parameters these, too, behave in somewhat unexpected ways.

Playing In The Band

The DX–7 can store up thirty–two voices in its internal memory. The memory is battery backed up, so voices written to it stay there even if the juice gets switched off. In addition, one can plug in any of several voice cartridges to add up to sixty–four ROM based voices to the repertoire. We'll get into just what the voices can do in minute.

A voice is simply a list of parameters for the FM synthesizer. It defines how some of the analog–type values are set... the depth of the low frequency oscillator, for example... and which algorythm is to be used. It also defines what and how much of it goes into the inputs of the operators in the algorythm. This data defines a specific sound which, if it's chosen properly, will sound like a real instrument with astounding clarity.

In playing the DX–7, one can select from among the voices in the thing's memory... or in a ROM cartridge if one is being used... through a herd of membrane switches on the thing's control panel. However, as we'll get into, this is far from the only way to do it. There's an LCD display that will hold the name of the voice being used at the moment.

The final aspect of the DX–7 is its keyboard. Unlike many simple organ type keyboards which have been infested with computer interfaces, the DX–7 keys are incredible. To begin with, they actually feel like they're playable. They have just the right resistance when you depress them, feeling quite a lot like the action of a decent piano. More to the point, the keyboard can render a whole range of information about what its keys are up to. Besides simply noting which keys are down, it will describe the force they went down with, how fast they come up and how much pressure is placed on them at the bottom of their travel.

Many of the DX–7's voices are designed to use this information. For example, the amount of low frequency modulation one hears in a note can be proportional to the amount of pressure one places on a key before one releases it.

In addition to the keyboard there are a number of performance related things happening in the DX–7, such as pitch and modulation wheels, several optional pedals and a breath tube... for when all of your other extremities are tied up. There are no eyelid actuators as yet, but perhaps they're coming.

Now... the Computers

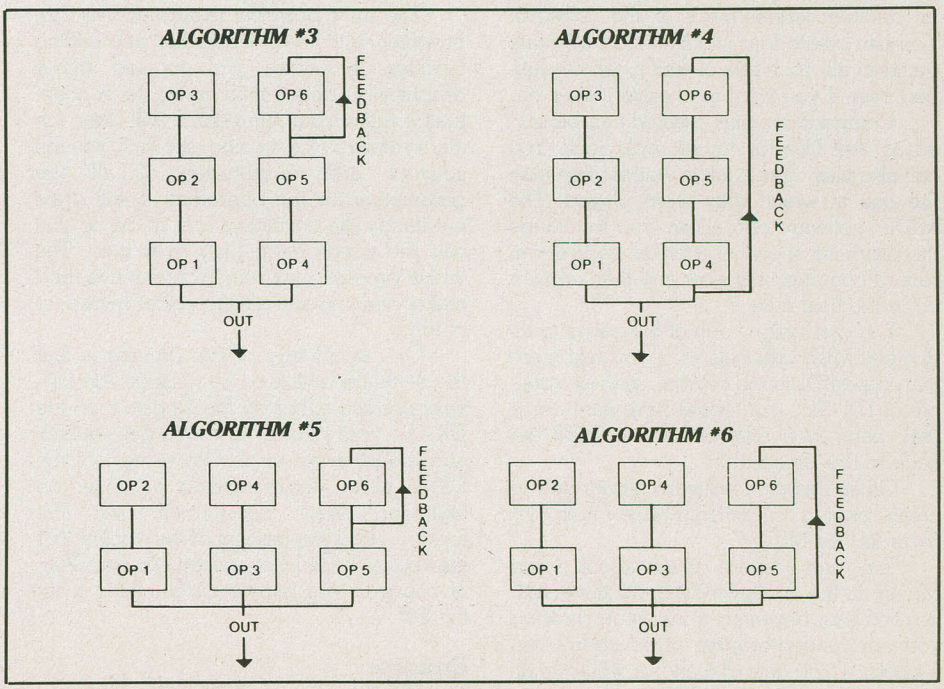
At this point most heavy computer trolls will be peering at the photographs and wondering what this sort of expensive electric piano has to do with computers. Well, along with quite a number of jacks and plugs and such out at the back of the DX–7 there is a set of MIDI jacks. Fitted with a suitable interface, a computer can talk to the DX–7 and lay controls on virtually all of its parameters. The DX–7 can talk back, sending the computer performance data from its extremely splendid keyboard.

Some of the things that one can do with the DX–7 as a MIDI device are described elsewhere in this edition of Computing Now!. Specifically, some of the really wild IBM based things are handled in the article about the Personal Composer and the Roland MPU–401. However, the first software for the DX–7 was written for Apple and, in some areas, it's still some of the best stuff to plug into it.

If you have both a PC and a fruit you can plug them both into the system, of course. The MIDI bus is extremely flexible in this respect.

Pretty well all of the Apple stuff that I've tried for the DX–7 presupposes the use of a Passport MIDI interface card. This is a slab of fiberglass that lives in slot two of the fruit of your choice and allows it to behave like a MIDI device.

As far as the DX–7's MIDI interface is concerned... and anything else's MIDI interface, for that matter... other devices connected to it don't really have identities *per se*. They have channel numbers, and, as



A few sample DX-7 algorythms.

such, places for data to come from and go to. There's a more complete explanation of the MIDI interface in the December 1984 edition of Computing Now!.

An Apple with a Passport card... and the right software... can behave as a number of things to the DX–7. One could write all sorts of dedicated programs for the thing, playing music under program control, of course. The Passport card is fairly easy to manipulate and the DX–7 talks in pretty standard MIDI terms. However, it's the third party canned software which really makes it a roll in the tall grass.

The most basic function of an Apple in the works is as a sort of virtual tape recorder. There are several packages to make it do this, but the one which is most commonly found is the Passport MIDI/4... 'cause they'll try to sell you one when you buy the card. In fairness, the Personal Composer on the PC is oceans more capable than the Apple software in this respect, but the MIDI/4 package will give you a good idea of what the DX–7 and a computer can do.

With MIDI/4 running the Apple will accept MIDI data from the DX–7 in real time. This means that you can tell it to start recording and then play music on the DX–7's keyboard. Aside from simply coming out of your speakers as sound, the digital codes that describe what you've played will slip through the MIDI interface to be stored in the Apple.

Having been stored the music data can be played back through the DX–7. This will recreate exactly what you played down to the slightest nuance of timing and velocity. More to the point, however, while you are playing it back you can record more stuff on another virtual track of the software. You can create four simultaneous, separate tracks in all, each one of which can be dubbed over if you want to change it later on.

Compositions thus created can be saved as disk files for future replayings. You can also play them back in voices other than the one in which they were played. The MIDI/4 software also allows you to change the playback speed of a piece, so you can record complex stuff slow and then crank it up in the final mix.

You can assign each of the tracks to individual MIDI channels so, if you had more than one MIDI sound source.. such as a couple of DX–7s... you could have each track play back in a different voice. We'll get back to this presently.

Other Passport software allows you to create printed scores from MIDI music files recorded by MIDI/4.

The only severe drag about using MIDI/4 is that it's severely copy protected. Beyond this, however, it insists on showing you a prolonged graphic introduction when it boots, which gets dull after a while. In all fairness, I don't use MIDI/4 any more... there are so many better things available for the PC and the DX–7 to handle these functions.

Voices of the Gods

The thing that keeps an Apple in my MIDI system is a program called DX–Pro. It's designed specifically for the DX–7, and is essentially a voice librarian and editor.

To its credit, the DX–7 contains facilities for editing every parameter of its internal voices... but you wouldn't want to do it this way. You have to describe the things you want it to change in very abbreviated terms to fit on its tiny LCD display. However, the designers of the internal works, recognizing that this could be something of a drawback, have allowed for all the voice data to be read out and spewed back in through the MIDI port.

DX–Pro allows you, first of all, to replace the DX–7's thirty–two internal voices with any of a number of *performance groups* that are stored on Apple disks. Once you've sent over a new group to replace the one that's currently in the DX–7 the new voices will stay in memory until they're changed... the DX–7's battery will keep them alive.

It's usually the case, however, that the groups of voices which one finds in ROM packs or in performance libraries don't all suit whatever one wants to do. As such, you can create your own arrangements of voices, adding, subtracting and rearranging them as needs be. The new groups can be added to one's disk library, to be spewed into the DX–7 as they're to be used. Sending over a whole new choir of voices takes less than fifteen seconds, so you can hold dozens of specialized libraries on a disk and yell for 'em when you want 'em.

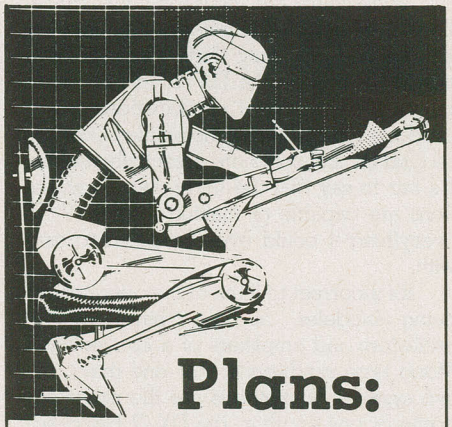
The most powerful feature of DX–Pro, however, is in its voice creation and editing facilities. It allows you to see things graphically, rather than trying to conceptualize them from numbers. It will draw the algorythm a voice is using, showing you the sources and amplitudes of all the parameters for the operators. It will draw out things like envelopes and so on, so you can see what's happening over time. The whole process is extremely interactive, and makes creating and editing voices quite a lot of fun.

One peculiarity of this process is that the software will take commands through keys pressed either on the Apple or on the DX–7... your choice. If you forget yourself and toodle away on the lower part of the DX–7 while you're editing a voice the highlight cursor dances all over the screen... a bit reminiscent of the display that the Alpha Syntauri produced. It's harmless, of course... you can't trash anything from the DX–7.

Encore

The DX–7 is a very playable instrument in its own right, and one sees a lot of them in bands without a computer in sight. However, it represents one of the first really affordable and really capable computer music systems. It will talk to anything with a MIDI interface and is unquestionably one of the best... at least, the most listenable... synthesizers that can be had for any price. It's capable of producing music which is, in many cases, indistinguishable from that sent forth by the acoustic instruments it imitates.

Because of its sophisticated MIDI interface, the DX–7 allows whatever computer is associated with it to have as much control over it as would a human being sitting at its keyboard... something which computer music toys have traditionally lacked. This is a programmer's delight, of course, but it also has allowed for applications software for the system of an unparalleled degree of sophistication.

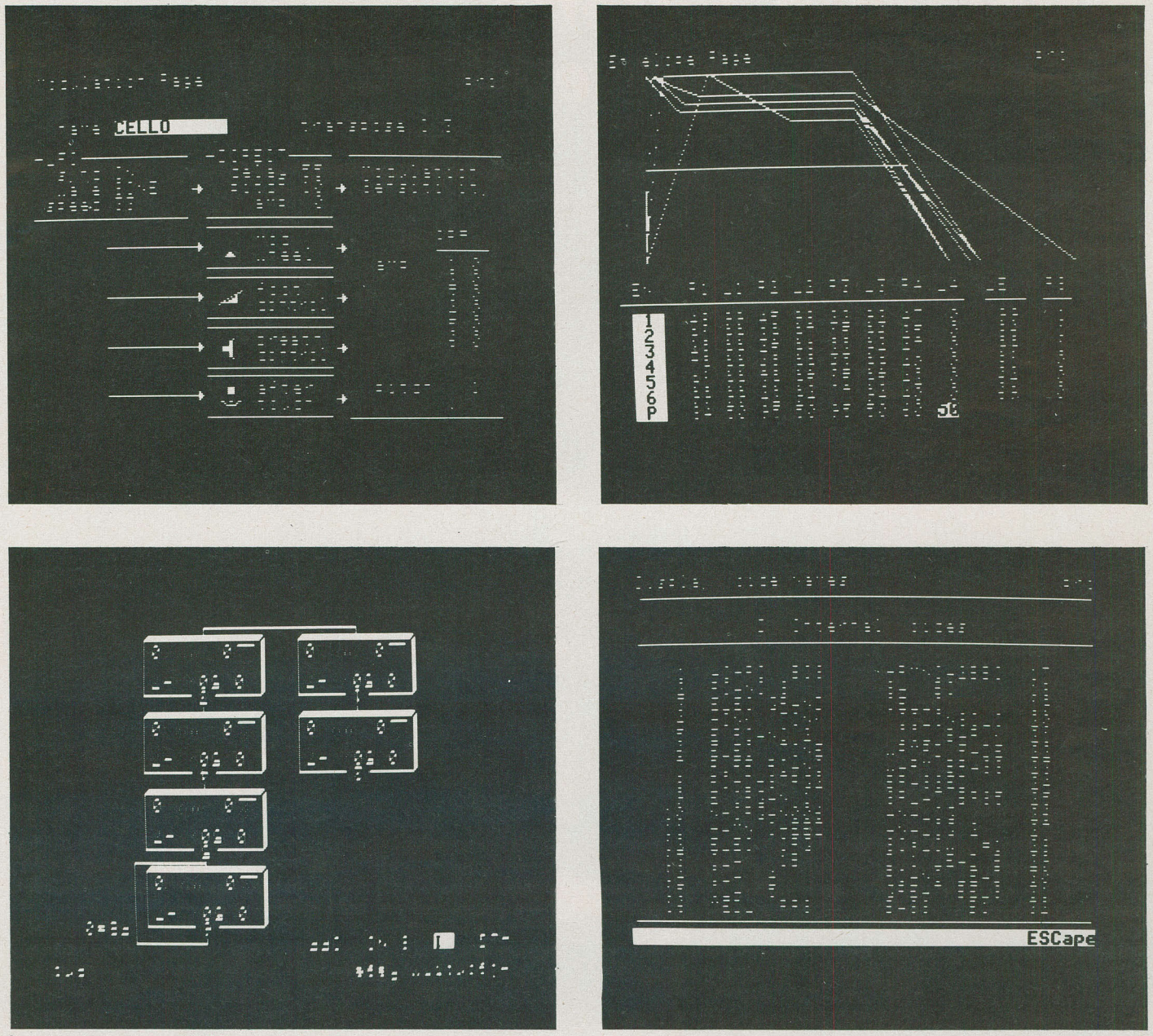


Plans:

System:	**Yamaha DX-7**
Function:	**MIDI keyboard and music system**
Voices:	**32 internal, 64 in ROM packs, hundreds on disks.**
Software:	**All MIDI based software for a number of computers, plus several dedicated voicing programs.**
Keys:	**61, C1 to C16, velocity and pressure sensitive, sixteen note polyphony**
Signal output:	**-10 dBm, 600 ohms and an 8 to 150 ohm headphone jack.**
Manufacturer:	**Yamaha**
Distributor:	**Computer Music Centre, XL Electronics**
Price:	**$2,795.00**

Circle No. 53 on Reader Service Card.

The DX–7 is among the most engrossing computer peripherals available and, while the suits will give you a hard time if you try to justify one as an adjunct to the accounts system, most actual humans will find themselves blown away in the first couple of hours by it. Once you get finished not believing that a synthesizer can do what it can do you'll be ready to start not believing what your computer is capable of when the



Some of the screen of DX-Pro and the DX-7.

two of them get together.

There are a few finite limitations to the DX–7. It is, for example, capable of complete polyphony but only in one voice at a time. Playing back multiple tracks from a MIDI recorder, like the Personal Composer or the MIDI/4, through a single DX–7 means that all the tracks will sound in the same voice. You can use multiple DX–7s to get multiple voices, of course, but this runs into heavy bucks. Other systems, such as the Yamaha CX5M we looked at in the August edition of Computing Now!, allow for multiple voices in one box. However, the DX–7 is a much better trip to play and I like the sound of it a better than that of the CX5M.

If you have both, of course, you can have the best of both worlds. Fortunately, CX5Ms are fairly cheap.

I'm told that there is a rack mounted, keyboardless version of the DX–7 available for applications wherein one wants multiple simultaneous voices, although I haven't played with it.

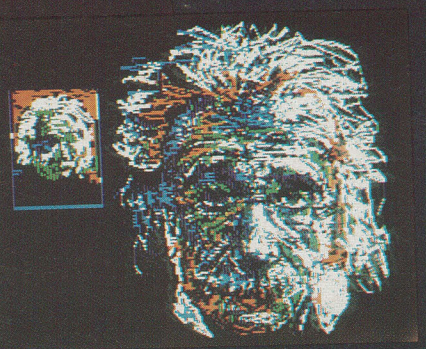
If you are in the least bit interested in computer music your future incarnations and general life essence and karma will curse your very soul if you don't try out a DX–7. Your Visa limit may curse you if you do, to be sure, but, hey, it's a lot better to be at peace with eternity than it is to be paid up with Visa anyway.

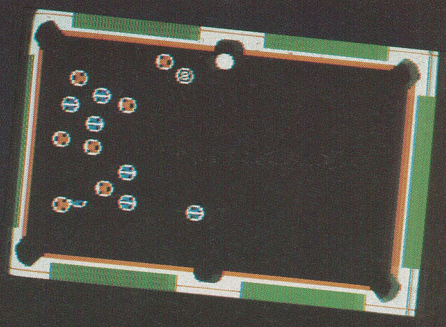
Ongoing thanks is due to Greg Stephen, who has continued to turn me onto new MIDI stuff. Greg now has a computer music store of his own, X.L. Electronics at 317 College Street. Among other things, not surprisingly, there are a lot of DX-7s down there. While there isn't any place to get good subs in the general area, there's a decent burger stand down the street. CN!

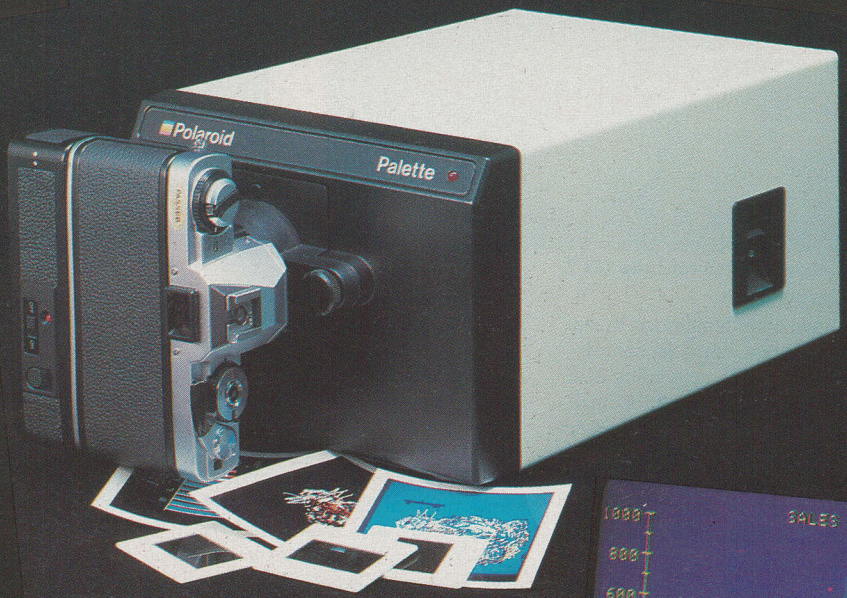
Polaroid Palette Review

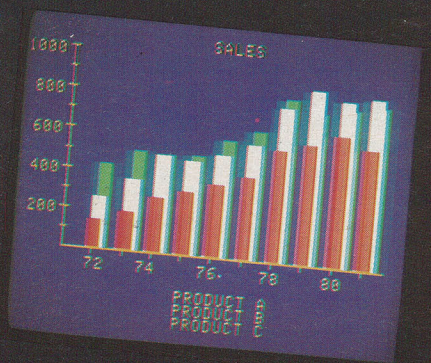
If you've ever tried to take screen shots from a computer monitor you'll already have a fundamental understanding of the inestimable worth of the Polaroid Palette... a box that takes you away from all that. For everyone else, still huddling in dark rooms with wobbly tripods, we present this exposure.

by Steve Rimmer









Polaroid Palette

There are a number of fairly decent purposes one might have for taking pictures of a computer's screen. If you lack a printer, for example, a camera is better than nothing. Admittedly, it's not a lot better than nothing and, if your only reason for approaching the problem of hard copy photographically is that you can't afford a Gemini 10X this article won't help you. The toys involved cost considerably more than does a Gemini 10X.

In many respects you can't dump a video screen to plain paper with the same colour and resolution as one gets on a tube no matter how much money you have to blow on peripherals. Even really slick toys, like six pen plotters and ink jet printers, are necessarily limited in the range of colours they avail one of. Furthermore, they leave you with paper... which isn't always the best thing you can have.

A computer... with some appropriate graphics software... is one of the most flexible tools imaginable for generating business charts and graphs. If you want to be able to illustrate meetings and presentations with slides, do title graphics or otherwise put the silver salts under computer control, acquiring the facility to spew your data directly onto film is invaluable.

Having bought a graphics package the only weak link in the process is, of course, taking pictures of one's screen. We used to do a lot of this in the traditional way... with an old Levi jacket draped over a couple of long pipes to keep most of the light off the screen and a number of quasi-religious talismans scattered about to appease the gods. Computer magazines just seem to demand screen shots.

A while ago we retired both the Levi jacket and the talismans in favour of something a lot better, if rather more elaborate. We got a Polaroid Palette and life became real again. Birds sang in the trees... they were singing anyway, but one could hear them now because the sound wasn't being muffled by all that denim. The sun shone, the grass grew and there was a bright future before us all that suddenly we knew we wouldn't have to spend it in the dark pretending to be mushrooms.

The Palette is a really great toy and we've come to appreciate its talents.

Raindows for Hire

In its simplest form the Palette is a dark box with a hole in the front and a picture tube inside. You clamp a camera over the hole, lay a picture on the tube and... like authentic thirteenth century alchemical sorcery... a picture shows up on the camera's film if you've remembered to load some in. In fact, the system is rather more sophisticated than this.

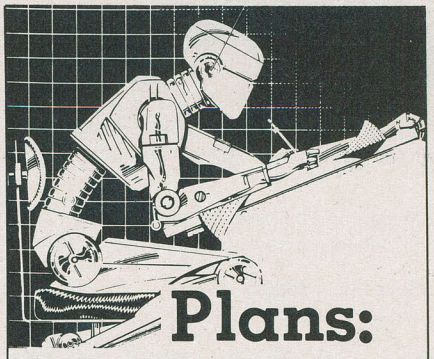
There are a lot of things basically wrong with taking pictures of video screens. The front of a normal picture tube is not a flat piece of glass at all, but, rather, a section of a sphere. It pretty well has to be this way, as the beam of electrons that forms the image on the face of the tube comes from a single point, to wit, the centre of the sphere the surface would be a section of if it were all there.

The Polaroid Palette gets around all this by virtue of its audience. Rather than playing for a packed house of humans, it shows its stuff to a camera. The camera is pretty close to its screen and, as such, the screen can be very small. The actual tube inside it is only a couple of inches across but about a foot long. It is a very good tube... the resolution is tight... and it's black and white. The images the thing generates, however, are in full colour. This is, to be sure, quite the trick.

The important thing about the Palette is in the time it takes to create a picture. Exposures generally go for about a minute. This allows the brightness on the tube to be very low... making things a lot crisper... and it allows some rather peculiar mechanical things to come down inside the box.

At the front of the Palette... just inside the hole where the camera mounts... there is a wheel with three coloured filters on it, one each for red, blue and green. If you have ever ripped the back from a colour television you will recognize these colours as being the basis of all the colours one sees dancing across the phosphore. The Palette, then, does three colour exposures for each image... once through each of the three filters... for the correct times to generate the colours it needs.

The result of this seemingly primitive approach to colour photography is a picture which has all the colours of the computer display it was created from but a degree of resolution in excess of that which one could hope to score from even a really good monochrome monitor.



Plans:

System:	**Polaroid Palette**
Computer:	**Apple, IBM, compatibles**
Includes:	**Serial cable, software, manual, Polaroid back, 35mm Minolta back, film, Polachrome processor, assorted cables.**
Manufacturer:	**Polaroid Corporation**
Distributor:	**Preck Photographic of Canada Ltd., 20, Apex Rd., Toronto, 789-7826**
Price:	**$2,395.00**

The Main Menu

The basic Palette is a fairly sophisticated trip... it comes with not only the box itself but some driving software, a serial interface and two cameras... one to do quick Polaroid test prints and another dedicated thirty-five millimeter body to render things as slides. There is also a Polachrome processor... we'll talk about that in a second or two.

In addition to all this hardware there is also some software to plug into your computer. I tried the Palette for the Apple and the IBM... it was the same box, actually, with different programs. One always uses the Palette under its own driving software, rather than under the control of a graphics package.

The Palette is controlled through an RS-232 port. As such, the software does as the control stuff, checking out the exposure and even firing the camera if you're using the thirty-five millimeter body. This is extremely important, because one of the things that the Palette does very well is all in the exposure.

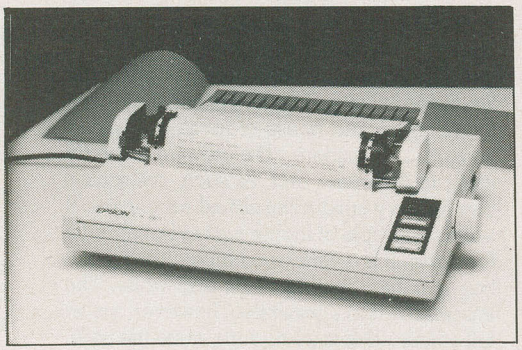
In use the Palette is extremely simple. One starts with a binary file of the image one wants to Palettize... or turn into a Palettation. Technology does really rude things to English. This is pretty straight up on the Apple... image files are naturally stored in a form that the Palette software is happy with. The IBM is a bit trickier... you have to load a preboot program which allows one to capture screen images one generates under other software for later use with the Palette. Most PC graphics software saves pictures as co-ordinate lists rather than bit maps. However, the little preboot seemed to be happy under everything I tried it with.

Having scooped some images into files one boots up the Palette driving software. In both cases this runs under BASIC... which is cool, in that it would allow one to change the drivers really easily if one wanted to. However, this can be a bit nasty under the PC... it uses the BASIC communications statements which are frequently somewhat funky under some implimentations of BASICA on some of the more moderately priced... or "cheap and sleazy"... compatible systems. If you're unsure as to whether you computer will exhibit this problem, try the COMM.BAS program that comes with BASICA. It uses the same statements and, as such, serves as a reasonable test.

The software itself is menu driven and so simple it could be operated by a professional carpet saleman without problems. It's quite the effort in human engineering... many carpet salesmen experience difficulty in walking and chewing gum concurrently. It's all menu driven and has on line help for those few occasions when things don't make complete sense immediately.

There's also a really lucid manual with the thing. However, there aren't many

The Fourth Computing Now! Giveaway



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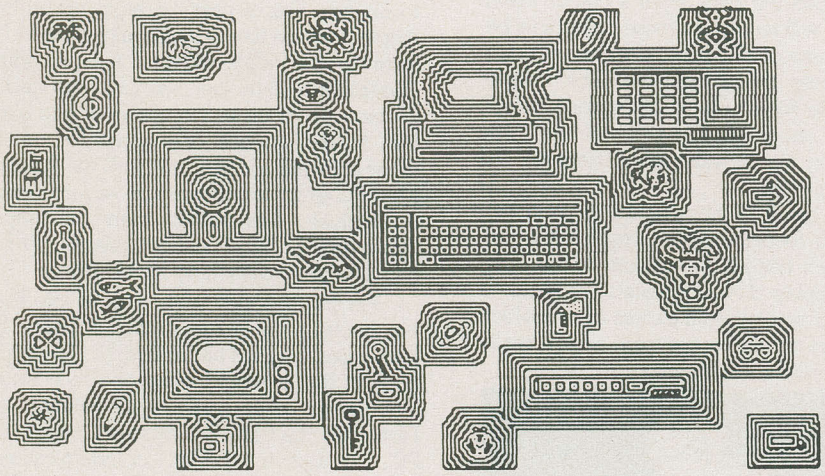
Anyone who wouldn't get a serious high from a free Epson LX-80 printer is either already possessed of one or just simply possessed. Aside from being among the latest systems to come from Epson, this printer features both a draft mode, burning up the paper at a hundred characters a second, and a near letter quality mode at sixteen characters per second. It also handles high resolution graphics and over a hundred and sixty type faces.

In order to win this magnificent printer and our choice of either an authentic Epson packing carton or a fully equipped Lear jet . . . yes, we'll probably choose the packing carton . . . all you have to do is to be the first person to have his or her entry drawn from our contest entry swimming pool with the right answer to this month's question.

This month's question is based on a true story . . . okay, an almost true story. It is the story of Max and his computer. One day Max was playing "Galactic Nose Invaders" on his computer when it unexpectedly flew into the eleventh dimension and fell apart, the warrantee being invalid in higher order spacial and/or temporal phenomena. This is about what Max was when it happened.



You have to help Max find his computer. The stuff he still hasn't gotten back includes:

- A floppy disk with "Galactic Nose Invaders" on it
- A monitor
- A Hayes SmartModem
- A PC keyboard
- A peripheral card
- An Epson printer
- A cheap joystick from Taiwan
- A mouse

Actually, Max is pretty distraught about all this, and if you can find just four of these things we'll be happy to accept your entry. Just send us this page . . . or a photocopy of it . . . with circles or arrows or some sort of marks to indicate where you think Max's computer parts are.

Please send us one entry only. We are very concerned that the amount of mail we get for these contests will make the planet lopsided and cause it to lunge into the sun, something we'd all rather not have on our consciences.

All entries must be in our pool no later than October 1, 1985ad.

Teleport your entries to . . .

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Toronto, Ontario
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pages to it because there just aren't that many things you can do wrong.

Colour Me F6

One of the things that the ads for the Palette don't really make clear... but, to be sure, one of its slickest capabilities... is its capacity for *not* reproducing the colours your computer originally used. If you want to be boring and unoriginal you can get it to generate slides that look just like a video display. However, you can also become quite weird.

The software allows for seventy-two colours, any of which can be assigned to replace each of the Apple's normal colours. If you really don't like the normal ones you can make the changes permanent by saving them to a disk file... you can have as many sets of colours in files as you like. There is a menu which allows for assigning the Palette's colours automatically... you don't have to juggle exposure times or anything nearly this crude.

The software also allows you to arbitrarily lighten or darken any image by as much as a full stop either way. In some cases this just makes nicer looking images. However, in most cases you can get different sets of colours this way. The test prints are useful for seeing what you're going to get without decimating a year's stock of film packs.

The software even takes into account the type of camera you're using and the speed of the film. It'll keep a running count of the number of pictures you've taken and tell you when you run out of film. Thus, having loaded in an image file and adjusted the exposure and the colours if you feel like it, all you have to do is to hit the space bar and wait. The image being exposed comes up in sections... upside down and backwards, which is a bit weird... on the screen. The software tells you when the exposure is done.

The Polaroid film back is pretty straight up. It's one of the old style trips, with paper tabs to pull and oozing negatives. However, these things do pretty decent pictures and are ideal for checking out what one's shots are going to look like. The Polaroid back has a dark slide, so you can unclamp it any time you feel like you want to switch to the thirty-five millimeter back.

The thirty-five millimeter camera is actually a modified Minolta. There are no meaningful adjustments to worry about... the Palette even operates the shutter and there's a motor drive to spare your delicate fingers from over exertion. You can load it up with any sort of film you fancy... although the system comes with some rather unusual film to play with.

The final party in the Palette is something called Polachrome. This is pretty new... it generates instant slides. One loads the camera with it, blows the roll, winds it back into the cassette and then processes the whole works with a weird little black box that comes with the system. It takes about two minutes to go from raw film to finished slides.

Polachrome is a perverse bit of chemistry. The slides it renders are a bit grainy and look pretty strange when they're held up to the light. They don't project badly, though. They'll suffice for many applications of the Palette. If you don't like them you can load the camera with Ektachrome and wait for the truck at Fotomat.

Have Film, Will Travel

The Polaroid Palette does extremely nice work. It generates slides which are just about on a par with those done by professional graphics houses using film and knives and other old tech tools. However, it does them in minutes instead of days and... once you've paid off the Palette itself... for a fraction of the cost.

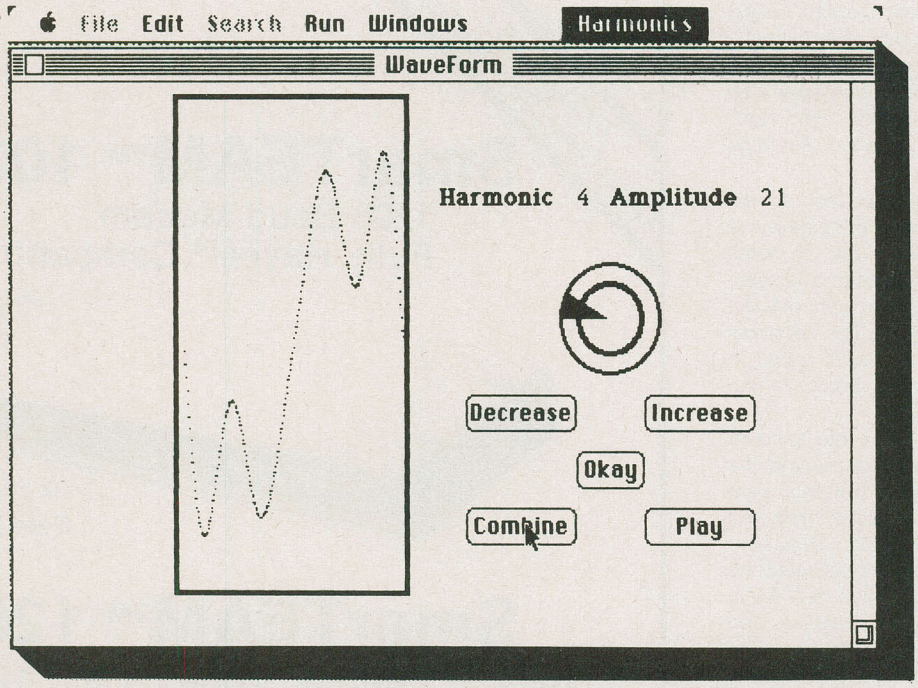
If you're into business graphics and sitting in dark rooms with a slide projector while the board checks out growth curves and bar charts you should give serious thought to the acquisition of a Palette. It's a nice little box. **CN!**

Circle No. 54 on Reader Service Card.

WaveForm for the Macintosh

Experimenting with the Mac's sound possibilities under BASIC can take a lot of typing... unless you use a program to do all the calculations. Here's a sonata in four part scanning tables.

by Steve Rimmer



One of the really surprising things about the Macintosh . . . once you get into programming it . . . is its musical predeliction. Far from simply having a control G beep that hums tunes, the Mac can do four voice music with programmable waveforms. In fact, it does true digital synthesis.. in real time... with the sort of fidelity that a few years ago one only found in dedicated computer music cards.

The newest revision of Microsoft BASIC supports the sound generation capabilities of the Mac quite well, allowing for both the rendition of tones in four simultaneous voices and the definition of the waveshapes they'll toodle in. This is richly profound.

Complex waves... the sounds produced by almost all musical instruments... are actually comprised of sine waves and sundry harmonics. To look at this another way, you can make up any complex waveform by mixing together the right sorts of harmonic energy.

The WaveForm program is an experiment in sound textures. It allows one to select the quantities of harmonic energy that will go into a sound and see what the resulting waveform will look like. As the waveshapes of the Mac must be defined mathematically it's fairly easy to display them as graphs... sort of a virtual oscilloscope.

Having found an interesting wave shape the program will play some actual music with it to see what it sounds like.

Synergy

If one wanted to create a sine wave electronically one could simply build an oscillator to emit one. This is a circuit which puts out a constantly changing voltage which repeats its cycle periodically. The time it takes to repeat itself determines the frequency of the sine wave, or, in musical terms, the pitch of the note.

To do this under computer control... what gets called *digital synthesis* when you get involved in it... requires rather more hardware. For a computer to generate a sine wave... without simply building an oscillator into it... we must write a program to handle a sampled waveform.

If you could freeze a sine wave several hundred times over its cycle and measure its voltage you'd have several hundred *samples* of the complete wave. Actually, you could do this with any wave shape. Put these things one after another and you have what is called a *wave table*. Now, if we give the computer a way to convert numbers back into voltages... what they call a *digital to analog converter*... and send it the numbers one after another the computer would recreate the sine wave.

Well, it'd be an approximation. However, with enough samples it would be a pretty good one. We'll use two hundred and fifty-six samples in this feature.

More than simply recreating the sampled wave, the computer could control the pitch of the sine wave it produced by changing the speed at which it fed data to the digital to analog converter. It could also change the volume by adding or subtracting a constant value from all the numbers in

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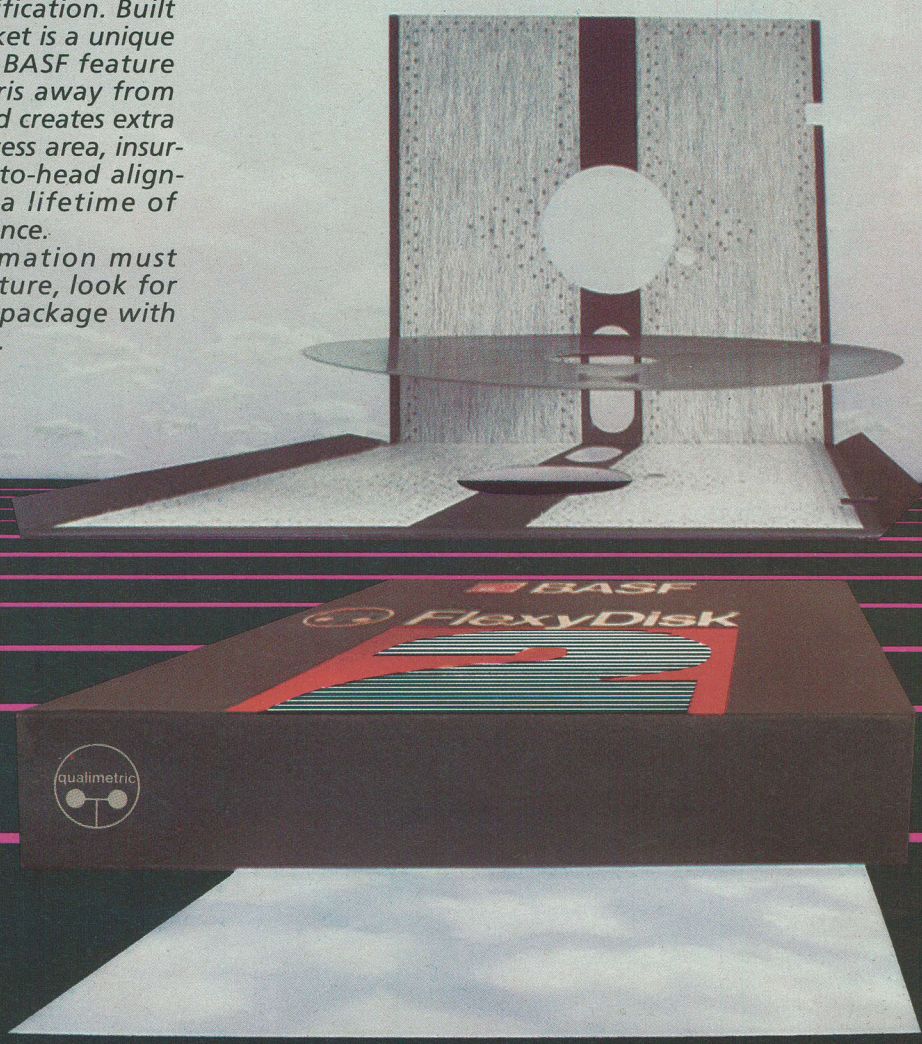

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the table.

Having gotten this far it should be obvious that if the table is just a string of numbers it can be generated programmatically as well as by sampling a real sine wave. By taking the trigonometric sine... the BASIC SIN(x) function... of two hundred and fifty-six values between zero and twice pi... the other end of the cycle as far as BASIC is concerned... we'd come up with two hundred and fifty-six table entries all ready for scanning and spewing out at the frequency of our choice.

The Mac has all the digital to analog conversion hardware already stashed away in there somewhere. The system software takes care of the scanning... under BASIC using the SOUND command. One can have the music of the spheres... or Twisted Sister devouring a motorcycle... by providing the whole brutish mess with a table to scan.

Under BASIC, tables are designated as integer arrays using the WAVE command. As such, all we have to do is to set everything up in memory and lay one line on the computer. The SOUND instruction allows tunes to be played in any predesignated voice... although we're not going to get into that here. Although we'll be using four voice music all the voices will be generated by the same array.

Aside from being able to generate simple sine waves we can have the computer mathematically spew out scanning tables for more complex sounds... the harmonics we spoke of earlier. This generates a sine wave

```
FOR X = 0 TO 6.28 STEP 6.28 / 256
ARRAY1%(X) = SIN(Y)
    Y = Y + 1
NEXT X
```

while this generates its second harmonic

```
FOR X = 0 TO 6.28 STEP 6.28 / 256
ARRAY2%(X) = SIN(2 * Y)
Y = Y + 1
NEXT X
```

Having run the previous two bits, this generates a complex waveform which is a combination of the fundamental and its harmonic.

```
FOR X = 0 TO 255
COMPLEX%(X) = ARRAY1%(X) +
              ARRAY2%(X)
NEXT X
```

We could further alter the resulting waveform by adding still more harmonics and changing their various amplitudes relative to the fundamental.

Allowing for five harmonics... anything much above this hasn't a lot of affect on the sounds the Mac produces at musical pitches... and the ability to control their amplitudes we can generate tables for virtually any waveform the Mac is capable of producing.

Ride Them Waves

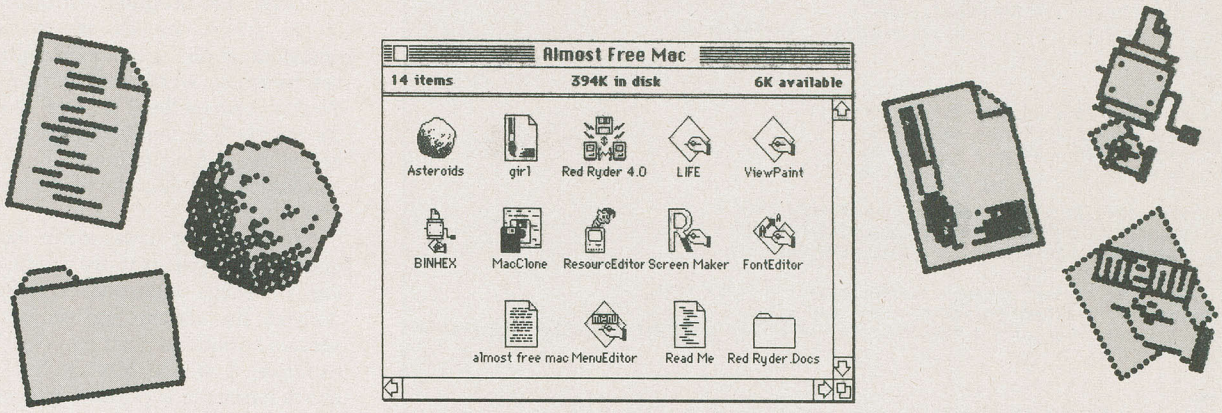
The waveform program shown here does two things. It allows one to compose waveforms on the screen, adding and subtracting harmonics to see what the resulting sound will look like. It also plays the resulting sounds as actual music. I've lifted the music playing program from the BASIC system master for the occasion. This has the side advantage that you probably won't have to type in the latter half of the program.

WaveForm maintains five values for the levels of its harmonics... yes, I know, what it calls the first harmonic is actually the fundamental. You can select the harmonic you want to adjust from the harmonic menu and alter its volume with the *increase* and *decrease* boxes. The volume control knob will give you a relative indication of where things are at.

If you click the *okay* box the program will calculate a new sine wave at the relative pitch and amplitude you've chosen and display it on the tube. Hit *combine* and it will create a complex wave from all of the harmonic values it's holding. Mouse *play* to have it play its built in tune using the waveform you've created. Clicking the mouse while the program is playing will

```
    WaveForm for the Macintosh
    Copyright (c) 1985 Steve Rimmer


    Plays Jesu, Joy of Man's Desiring in any freaky
    organ stop you can devise with five harmonics

    If Bach weren't dead this would kill him.

    This program is not to be distributed in machine
    readable form without the author's written permission


   TooPi = 3.14159 * 2 : KnobX = 350 : KnobY = 125
   DEFINT C,F,V,I
   DIM array%(5,255), Amplitude(10), WaveForm%(255), Timbre%(255)
   DIM F#(88), CF(19), CT#(19)
   Harmonic = 1 : Amplitude(Harmonic) = 64
   GOSUB DrawKnob : GOSUB SayHarmonic : GOSUB SetMenu
   GOSUB SetButton : GOSUB DrawFrame : GOSUB InitWave
   GOSUB PlotArray
   ON MENU GOSUB WhatHappened
   MENU ON

KillTime:
   WHILE DIALOG(0) <> 1 : WEND : B = DIALOG(1)
   ON B GOSUB DecreaseHarmonic, IncreaseHarmonic, AcceptHarmonic, CombineWaves, PlayTune
   GOTO KillTime

AcceptHarmonic:
   GOSUB DrawFrame : GOSUB InitWave : GOSUB PlotArray : RETURN
DecreaseHarmonic:
   IF Amplitude(Harmonic) >=2 THEN Amplitude(Harmonic) = Amplitude(Harmonic) - 3
   GOSUB SayHarmonic : GOSUB DrawKnob : RETURN
IncreaseHarmonic:
   IF Amplitude(Harmonic) =<124 THEN Amplitude(Harmonic) = Amplitude(Harmonic) + 3
   GOSUB SayHarmonic : GOSUB DrawKnob : RETURN
CombineWaves:
   GOSUB AddArrays : RETURN
PlayWaves:
   GOSUB PlayTune : RETURN

WhatHappened:
   WhatMenu = MENU(0) : WhatLine = MENU(1)
   IF WhatMenu <> 9 THEN RETURN
   Harmonic = WhatLine : GOSUB SayHarmonic : GOSUB DrawKnob
   GOSUB DrawFrame : RETURN

AddArrays:
   Bst = 0 :  GOSUB SetButton
   FOR x = 0 TO 255
      array%(0,x) = 0
      FOR y = 1 TO 5
         array%(0,x) = array%(0,x) + array%(y,x)
         IF ABS(array%(0,x)) > 127 THEN array%(0,x) = 127 * SGN(array%(0,x))
      NEXT y
   NEXT x
   H = Harmonic : Harmonic = 0
   GOSUB DrawFrame : GOSUB PlotArray : Harmonic = H
   RETURN
SayHarmonic:
   CALL MOVETO(KnobX-100,KnobY - 60)
   CALL TEXTFACE(1) : PRINT "Harmonic ";
```

Almost Free Software for the Macintosh



We've had public domain software for the Apple, for CP/M based systems and gallons of it for the IBM PC. After some digging we turned up some equally super stuff for the Macintosh. Some of these programs will blow your socks and some toenails clear off.

This collection consists of almost four hundred K of applications and documentation files. There is something in here for even the most jaded Macintosh user. Feed your mouse now . . . it'll need the energy.

Asteroids This is an implementation of the classic arcade game which is considerably better than most of the ones you lost your life savings in quarters to. The graphics are too splendid to be adequately described with mere words.

Girl Those of us who are quick enough explain this sort of thing as art. The rest call it lechery. However, it's a really well done MacPaint image in any case.

Red Ryder Telecommunications on the Mac has never been this easy. Red Ryder includes the XMODEM and Kermit protocols and lots of other features.

BINHEX A second banana of Red Ryder, this program converts applications files to binary files and back again to allow them to be transferred over phone lines.

Life Life is one of the classic computer programs, and this implementation is exceedingly well done. It simulates micro organisms living and dying . . . and eating each other. Alternately, it might be a parking lot full of Toyotas.

ViewPaint Ever want to check out a MacPaint file in a hurry without getting into MacPaint? This little utility lets you peer at the top bit of a picture with a minimum of overhead and waiting.

MacClone The disk copy routine in the Mac's system disk is a bit barbaric. This is a vast improvement. It even does in some copy protection schemes.

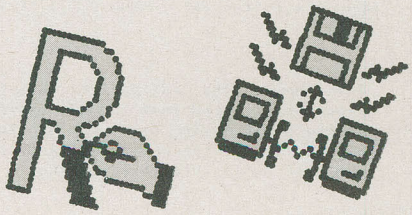
ResourceEditor The icons and other resource items of the Mac just cry out for meddling with. This little tool does it for you.

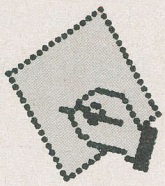
ScreenMaker Moving text from MacWrite to MacPaint can be a bit disappointing . . . something gets lost in the clip board. This utility lets your words make the trip unscathed.

Font Editor For those longing to make their own fonts . . . and for those who just want to adjust the ones they have . . . this application lets you fat bit to your heart's content.

MenuEditor All those words in the Mac's applications can be changed. This is the way to do it.

All of this rather incredible software plus the disk it resides on can be yours for a mere





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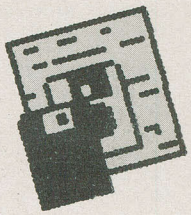


Fine print: All of this software was obtained from public bulletin boards and is believed to be in the public domain. Most of it is freeware . . . the authors would like some money from you. You should probably send them some, but this is between you and your wallet.

We are not charging you for the software, but rather, for our time in collecting, sorting and assembling it, plus the cost of the disk and postage and handling.

We've tested this software pretty thoroughly, and it all seems to work properly. Some of it is capable of hanging the system if it is used incorrectly. Some, like the Resource Editor, will require a degree of knowledge of the insides of the Mac to fully apply it. There isn't much documentation in this area . . . be prepared to have to experiment a bit. We are unable to assist you in applying this software to your specific needs.

This software is supplied without a finder or other system files on the disk. You will have to copy it onto a disk with a system to use it.

```
    CALL TEXTFACE(0) : PRINT Harmonic; SPACE$(3)
    CALL MOVETO(KnobX,KnobY - 60)
    CALL TEXTFACE(1) : PRINT "Amplitude ";
    CALL TEXTFACE(0) : PRINT Amplitude(Harmonic); SPACE$(4)
    RETURN

DrawKnob:
    a%(0) = KnobY-20 : b%(0) = KnobY - 30
    a%(1) = KnobX-20 : b%(1) = KnobX - 30
    a%(2) = KnobY+20 : b%(2) = KnobY + 30
    a%(3) = KnobX+20 : b%(3) = KnobX + 30

    CALL PENSIZE(2,2) : CALL ERASEOVAL(VARPTR(b%(0)))
    CALL FRAMEOVAL(VARPTR(b%(0))) : CALL PENSIZE(3,3)
    CALL FRAMEOVAL(VARPTR(a%(0))) : CALL PENSIZE(1,1)
    PointStart = 270
    PointEnd = PointStart + (Amplitude(Harmonic) * 1.41) + 90
    IF PointEnd > 360 THEN PointEnd = PointEnd - 360
    IF Amplitude(Harmonic) > 0 THEN CALL PAINTARC(VARPTR(b%(0)),PointStart, PointEnd)
    RETURN

DrawFrame:
    r%(0) = 6 : R%(1) = 94 : r%(2) = r%(0) + 266 : r%(3) = r%(1) + 138
    CALL PENSIZE(3,3) : CALL ERASERECT(VARPTR(r%(0)))
    CALL FRAMERECT(VARPTR(r%(0))) : CALL PENSIZE(1,1)
    RETURN

InitWave:
    Bst = 0 :  GOSUB SetButton : j = 100 : p = 0
    FOR x = 0 TO TooPi STEP (TooPi /512)
        k = (SIN(Harmonic * x) * Amplitude(Harmonic))
        array%(Harmonic,x * (255/TooPi)) = k : j = j + .25
    NEXT x
    GOSUB SetButton
    RETURN

PlotArray:
    Bst = 0 :  GOSUB SetButton : j = 100
    FOR x = 0 TO TooPi STEP (TooPi /512)
        PSET (j,array%(Harmonic,x * (255/TooPi))+138) : j = j + .25
    NEXT x
    GOSUB SetButton
    RETURN

SetButton:
    BUTTON 1,Bst,"Decrease",(KnobX-85, KnobY+40)-(KnobX-20,KnobY+60)
    BUTTON 2,Bst,"Increase",(KnobX+20, KnobY+40)-(KnobX+85,KnobY+60)
    BUTTON 3,Bst,"Okay",(KnobX-20,KnobY+70)-(KnobX+20,KnobY+90)
    BUTTON 4,Bst,"Combine",(KnobX-85, KnobY+100)-(KnobX-20,KnobY+120)
    BUTTON 5,Bst,"Play",(KnobX+20, KnobY+100)-(KnobX+85,KnobY+120)
    Bst = 1
    RETURN
SetMenu:
    MENU 9,0,1,"Harmonics" : MENU 9,1,1,"First"
    MENU 9,2,1,"Second" : MENU 9,3,1,"Third"
    MENU 9,4,1,"Fourth" : MENU 9,5,1,"Fifth"
    RETURN


'    The code for the last part of this program has
'    been duly scooped from the Microsoft Music program
'    on the BASIC master disk. You can avoid typing it
'    by copying the appropriate bits to the clipboard
'    and pasting it into this listing.

PlayTune:
    Bst = 0 :  GOSUB SetButton
    Log2of27.5# = LOG(27.5#)/LOG(2#)
    FOR x%=1 TO 88 : F#(x%) = 2^(Log2of27.5# + x%/12#) : NEXT x%

    FOR i = 0 TO 255 : Timbre%(i) = array%(0,i) : NEXT i

    WAVE 0,Timbre% : WAVE 1,Timbre%
    WAVE 2,Timbre% : WAVE 3,Timbre%
    C$ = "cdefgabp#-123468()l" : RESTORE
    FOR I=1 TO 19 :  READ CF(I) : NEXT I
    DATA 0,2,4,5,7,9,11,0,1,-1, 0,0,0,0,0,0, -12,12,0

    FOR I=1 TO 18 :  READ CT#(I) : NEXT I
    DATA 0,0,0,0,0,0,0,0,0,0, 36.4,18.2,12.133333,9.1,6.0666667,4.55, 0,0,0

RePlay:
    SOUND RESUME : RESTORE Song

    FOR v=0 TO 3 :  READ V0(v) : V0(v)=12*V0(v) + 3 :  NEXT v
```

cool it out and return you to the harmonic editor.

When the program first boots the harmonic arrays are all set to zero... no amplitude at all... with the exception of the first harmonic, which is set to half amplitude. You can change these defaults by setting up the members of the *Amplitude* array at the beginning of the program. Of course, you can also simply alter the levels once you're into things.

In designing a waveform there are a number of things that are worth considering. The shape of the final complex wave is derived by adding and subtracting the various harmonics point by point. Thus, for example, if at one spot on the cycle the fourth harmonic is positive and the second harmonic is negative by the same amount they will cancel each other out.

As a rule, the contents of a square wave are the odd numbered harmonics while a sawtooth wave will contain the even numbered harmonics. If you start with the fundamental set at a given value and add odd harmonics the resultant waveform will be lower in absolute amplitude than was the fundamental by itself. If you add even harmonics the complex wave will be higher.

If the waveform gets too large for the screen to display it, it will be clipped. This is not just a graphics consideration... the numbers which comprise the scanning table must be in a specific range as well.

The sounds which specific combinations of harmonics will make are predictable to some extent. Square waves... those comprised primarily of odd harmonics... will tend to sound thick and full. Reed instruments produce sounds which approximate square waves. You can get good heavy organ sounds with odd harmonics... most of what the Mac does musically approximates organ sounds because, despite its splendid timbral capabilities, it has a few hassles with dynamics.

Sounds with lots of even harmonics sound transparent. You can approach the sound of a viol this way, or get *vox humana* type organ noises out of the Mac.

Play It Again, Spam

Like so many things about the Macintosh, the musical bits it can get going should be heavy cream for your imagination. Get into these little guys and you'll be Larry Fast before you know it.

Of course, the extremely flexible sound hardware of the Macintosh is not limited just to doing music. It'll also handle sound effects for games and even a synthetic voice... there have been a couple of commercial programs which have done this creditably well. It might be a bit beyond the scope of BASIC, however.

Imagine a babbling Mac... I wonder how you'd get a machine to talk grey...

```
Loop:
    SOUND WAIT
    FOR v=0 TO 3
        t#=VT#(v)
        Fi=-1
        READ p$
        IF p$="x" OR MOUSE(0) <> 0 THEN GOSUB SetButton : RETURN
        FOR i=1 TO LEN(p$)
            Ci=INSTR(C$,MID$(p$,i,1))
            IF Ci>8 THEN 10
                IF Fi>=0 THEN SOUND F#(Fi),t#,,v: t#=VT#(v)
                IF Ci=8 THEN Fi=0 ELSE Fi=CF(Ci)+VO(v)
                GOTO 50
10          IF Ci<11 THEN Fi=Fi+CF(Ci): GOTO 50  '# or -
            IF Ci<17 THEN t#=CT#(Ci): GOTO 50  '1 through 8
            IF Ci<19 THEN VO(v)=VO(v)+CF(Ci): GOTO 50  '< or >
            i=i+1  'ln
            VT#(v)=CT#(INSTR(C$,MID$(p$,i,1)))
            IF Fi<0 THEN t#=VT#(v)
50      NEXT i
        IF Fi>=0 THEN SOUND F#(Fi),t#,,v
    NEXT v
    SOUND RESUME
    GOTO Loop

Song:
DATA 1,3,3,3
DATA 12g>ge, 12p2de, 12p216g3f#g3a, 16p6gab)dcced
DATA <b>e<e, ge<b, b3ab3ge3d, dgf#gd<bgab
DATA ab>c, a>dc, e3f#g3de3<b, >cdedc<babg
DATA d+#d, c<a>f#, a3>da3ga3f#, f#gadf#a>c<ba
DATA gec, g<g>e, d3f#g3f#g3a, bgab>dcced
DATA <b>ed, ge<b, b3ab3ge3g, dgf#gd<bgab
DATA cc#d, >ced, a3f#g3e<a3>c, e>dc<bagdgf#
DATA <gp3>g6d3<b6, dp2b3g6, <b3>gb3>dg3d, gb>dgd<bgb>d
DATA g>f#e, d<gg, 12<g1g, 12<b1>c
DATA f#ed, agf#, a1b, d1d
DATA ef#g, gag, bag, c1<b
DATA dp3d6d3d6, f#a3a6>d3d6, a16d3ef#3g, 16adef#aga>c<b
DATA <d>p3d6d3d6, f#3a6f#3d6<a3>d6, a3>c<a3f#d3f#, >c<af#df#a>c<ba
DATA gf#e, dde, g3dg3f#g3a, bgab>dcced
DATA b<b>e, gd<b, b3ag3f#e3g, dgf#gd<bgab
DATA cd<d, 14>c<a>d<b>c<a12, a3gf#3ga3c, e>dc<bagdgf#
DATA g>ge, b>de, <b3>dg3f#g3a, gbab>dcced
DATA <b>e<e, ge<b, b3ab3ge3d, dgf#gd<bgab
DATA ab>c, a>dc, e3f#g3de3<b, >cdedc<babg
DATA df#d, c<a>f#, a3>f#a3ga3f#, f#gadf#a>c<ba
DATA gec, g<g>e, d3f#g3f#g3a, bgab>dcced
DATA <b>ed, ge<b, b3ab3ge3g, dgf#gd<bgab
DATA cc#d, >ced, a3f#g3e<a3>c, e>dc<bagdgf#
DATA <g>f#e, d<gg, 12b1>c, 12g1g
DATA f#ed, agf#, d1d, a1b
DATA ef#g, gag, c1<b, bag
DATA dp3d6d3d6, f#16a3a>d3d, a16d3ef#3g, 16ddef#aga>c<b
DATA <dp3>d6d3d6, f#3af#3d<a3>d, a3>c<a3f#d3f#, >c<af#df#a>c<ba
DATA gf#e, 12dde, 12b1>c, bgab>dcced
DATA b<b>e, gd<b, d1<b, dgf#gd<bgab
DATA cd<d, 14>c<a>d<b>c<a, a4b8>c8<ba, e>dc<bagdgf#
DATA g>ge, 12b>de, 16g3dg3f#g3a, gbab>dcced
DATA <b>e<e, ge<b, b3ab3ge3d, dgf#gd<bgab
DATA ab>c, a>dc, e3f#g3de3<b, >cdedc<babg
DATA df#d, c<a>f#, a3>da3ga3f#, f#gadf#a>c<ba
DATA gec, g<g>e, d3f#g3f#g3a, bgab>dcced
DATA <b>ed, ge<b, b3ab3ge3g, dgf#gd<bgab
DATA cc#d, >ced, a3f#g3e<a3>c, e>dc<bagdgf#
DATA <gp3>g6f#3e6, dp3g6d3e6, <b3>gb3>dg3<g, gb>dgd<bdb>c#
DATA dc<b, f#dd, 12a1b, d<def#ag#g#ba
DATA a>a4g4f4e4, e<a>a, >c1c, a>c<b>c<aecde
DATA d<b>e, aag#, <bb4>c8d8<b, f>dcd<bg#ef#g#
DATA a>fd, e<a>f#, a16a3g#a3b, a>c<b>ceddfe
DATA cfe, afc, >c3<b>c3<af3a, eag#aec<ab>c
DATA dd#e, df#e, a3g#a3f#<b3>d, fedc<baeag#
DATA <a>ab, c<ag, >12c1d, a>ceap312d
DATA >c<ae, >cag, e1e, 16ecdegfgb-a
DATA fdg, df#g, dd4e8f8d, a>c<b>c<afdef
DATA cec, geg, 16c3<g>c3<ge3d, egfgec<gab-
DATA fdg, fag, c3ef3ab3>d, a>c<b>c<afdef
DATA cp3c6<b3>d6, gp3d6d3d6, c3<g>c3<a>d3<f#, ecdegf#gba
DATA <g>ge, dde, 12b1>c, bgab>dcced
DATA <b>e<e, ge<b, d1d, dgf#gd<bgab
DATA ab>c, a>dc, c<b1, >cdedc<babg
DATA dp3d6d3d6, c16<a3a>d3d, 16a3c#d3ef#3g, f#def#aga>c<b
DATA <dp3>d6d3d6, f#3af#3d<a3>d, a3>c<a3f#d3f#, >c<af#df#a>c<ba
DATA gf#e, 12dde, 12b1>c, bgab>dcced
DATA b<b>e, gd<b, d1<b, dgf#gd<bgab
DATA cd<d, 14>c<a>d<b>c<a, a4b8>c8<ba, e>dc<bagdgf#
DATA g1g2, 12gp3>g6d3g6, g16<b3>dg3d, gb>dgd<bgb>a
DATA g1g2, dp3g6e3c6, <b3g>d3b>c2, fd<bgb>ded<a
DATA g1g2, <ap3>d6<b3>e6, c3<ab2b3g, f#a>cd<bgegb
DATA g1g2, <e3a6f#3>a6f#3d6, a2a3f#d3f#, >c<af#df#a>c<ba
DATA g>ge, dde, g3dg3f#g3a, bgab>dcced
DATA <b>e<e, ge<b, b3ab3ge3d, dgf#gd<bgab
DATA ab>c, a>d<c, e3f#g3de3<b, >cdedc<babg
DATA df#d, c<a>f#, a3>da3ga3f#, f#gadf#a>c<ba
DATA gec, g<g>e, d3f#g3f#g3a, bgab>dcced
DATA <b>ed, ge<d, b3ab3ge3g, dgf#gd<bgab
DATA cc#d, d1d2, a3f#g3e<a3>c, e>dc<bagdgf#
DATA <g1g2, p2, <b1b2, g1g2
DATA p1,p1,p1,p1
DATA x
```

CN!

MIDI in New Orleans

The recent NAMM show featured some of the latest in MIDI technology. The author was there for several days... and in the night clubs, jazz bars and bistros of New Orleans for several nights.

by Greg Stephen

Twice a year the entire music industry gathers unto itself in a giant convention center for a four day new product extravaganza. The obvious purpose behind these affairs is to allow your local music shops to see, touch, feel and play the latest dazzling offerings from the hard working elves toiling in Apollo's factories around the world. Visually, the exhibition might appear to the outsider as a marriage of the Ringling Brothers Circus and the Hadassa Bazaar going at full speed inside the ballroom of Caesar's Palace.

It all takes place to the booming strains of thirty thousand amateur musicians all playing different tunes on different instruments at the same time. Once one has overcome the moral pangs that indeed the priesthood was the more honourable vocation, one musters the intent to wade, or rather sink, into the electric tinsel of the circus proper...

"Hurry, hurry, hurry, see the amazing leopard skinned girl tame the five necked MIDI guitar. Hear the astounding smoking Apple Computer actually continue tc make music despite the empty Coke cup lying atop slot two, the full contents of which are now awash across the motherboard. See the incredible singing elephant dance around the Macintosh mouse"...

This past summer the directors who deign to organize such an event saw fit to locate their show in New Orleans instead of Chicago. Now, while inside the New Orleans Convention Center one would really have no way of knowing they were not in fact inside Chicago's McCormick Place. Fluorescent lights and air conditioning are

pretty much the same everywhere. However, once outside in the hundred and three degree Louisiana humidity and particularly on Bourbon Street at two in the morning, strange things begin to occur. The reader will hopefully forgive any digressions that may infiltrate this otherwise placid attempt to relate what's new in computer music.

A thousand and One Korean Pianos

Our lodging in New Orleans consisted of a beautifully preserved seventeenth century hotel complete with fountained inner courtyards and gardens, situated centrally in the Vieux Carre, commonly referred to as the French Quarter. This is the original rectangular shaped town laid out by the French. The French Quarter consists of old buildings delicately dripping with iron laced balconies, narrow streets, flower filled patios, world famous restaurants and of course, Bourbon Street with its endless honky tonks and jazz establishments.

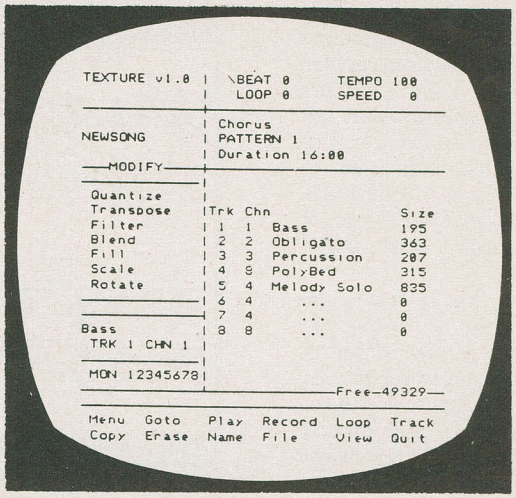
Nestled in a bend of the lower Mississippi, a short drive out of the French Quarter, is the Rivergate Expo Center. The organizers of this year's show had thoughtfully seen fit to place most of the music software in a separate building away from the larger convention center. Thus one could actually test software free from the distraction of a thousand and one Korean pianos in an adjacent booth.

Computer shoppers have often been advised to think about software first when they're investigating the purchase of a computer. Amidst the hundreds of new software companies at Rivergate we discovered a fresh slant on that adage. Think reliable individual programmers instead of generic software. Thus we were all the more delighted when our first contact at Rivergate was Paul D. Lehrman, the personable vice president of Southworth Music Systems.

Macintosh owners take note: you now have the definitive music software. Southworth's *Total Music* was by far the most powerful yet easy to use software amidst the veritable explosion of music on the Mac. Southworth designs and manufactures their own interface consisting of four parallel MIDI outputs and two independent MIDI inputs. The two inputs can be used for recording two MIDI keyboards simultaneously, or for a keyboard and drums, or for a keyboard and external syncing device.

The interface connects to the Macintosh via the modem and printer ports and sits next to the computer with the MIDI jacks at the rear. Southworth supplies the appropriate MIDI cables. The input to the Macintosh through the MIDI interface can be from any MIDI synthesizer or processing device.

The software is incredibly complete and, as one might expect, is entirely con-



Texture

Chances are if you were a music publisher wading through your warehouse full of books and sheet music you might have pause to query whether you really need twenty-five thousand identical hard copies of that pop tune that never quite took off. For the past two years, the music publishing industry, normally a paragon of implacability, has been lumbering about the computer field like a dazed Rip Van Winkle awakened from a long sleep. Virtually every major publisher has announced a software division, and products have already begun to spew into the marketplace, everything from 'shoot the notes off the music staff' to 'Michael Jackson plays the Commodore SID chip'.

The publishers are, of course, deadly serious. Everyone knows that the days of duplicate inventories spotted throughout the country are over. Music, like text, will soon be cabled directly to the end user. Not only that, but publishers have to find somewhere to invest all that cash from thirty years of selling Les Paul and Mary Ford song sheets.

As Carin Skinner of Sight and Sound, one of the three major publishers, states, "Just as music books are sold in music stores rather than book stores, computer consumers will look to specialty stores for specialized computer software programs." Mr. Skinner is indeed correct, and the publishers' concern for the health of the music retailer is quite touching. It will be all the more endearing should this same comraderie continue once music publishers gain direct access to the retail music customer via cable television and satellite.

Nevertheless, one publisher forging ahead and drawing some well-deserved attention is Cherry Lane Technologies, a division of Cherry Lane Music, another of the major pulp, paper and music companies. David J. Archambault, managing director of Cherry Lane Technologies is a veteran music number cruncher and indicative of the real commitment publishers have made to bring themselves online in the eighties. Cherry Lane Technologies have announced *Texture*, a new program by the respected synthesist and performer Roger Powell. Texture utilizes the Roland MPU401 MIDI interface and an IBM or Apple computer to create an eight track MIDI sequencer for the serious professional. Essentially, previous MIDI sequencers had suffered from a lack of access to the recorded material once it had been sequestered inside the computer. In most cases if you recorded a mistake you had to start from scratch again. Some systems offered punch in and punch out but if your error was near the beginning you had to rerecord everything from that point on.

***Texture* addresses these and other sticklers in a way reminiscent of the rhythm programmers for drum machines. Listen to a pop drum track and you will notice that in most cases, songs follow a repetitive series of patterns. To a lesser extent, the same may be said of the various keyboard and synthesizer tracks. *Texture* thus allows specifying motifs or short phrases of music that can be joined together in software to form a complete song.**

The edit section of the software gives us a closeup of the MIDI data and permits extensive fiddling. Notes can be manually inserted, deleted or adjusted in length. A series of notes can be copied from one track to another or joined together to form a single phrase. Once a number of patterns have been set up, songs can be arranged according to the order and number of repeats of the patterns, transposition, and tempo. Patterns may be looped during playback. Up to sixty-four patterns and sixty-four parts are available over eight tracks and these eight tracks may be further extended through the sync to tape option.

The required equipment includes an IBM PC or APPLE II, one disk drive and a video monitor. The interface is the Roland MPU401 with either an Apple or IBM card. For more information contact Cherry Lane Technologies, 110 Midland Ave., PO Box 430, Port Chester, NY 10573, (914) 937-8601.

Circle No. 55 on Reader Service Card.

trolled by the movement of the rat... sorry, mouse. As with most software of this genre one initially begins by recording a sequence from the music keyboard and the computer stores this as a track of music. Anyone familiar with multi-track tape recorders will understand the parallel. However, in this case instead of the usual four, eight, sixteen, or even thirty-two tracks, Southworth allows ninety-nine separate tracks, each of which can control sixteen different instruments.

Once a series of tracks has been recorded the editor screen allows for four different editing techniques. The program can simulate a tape recorder, with punch in and punch out. It can simulate a word processor, by cutting, copying, and pasting one channel or many, the entire track or just a few notes, bouncing to a new MIDI channel or keeping it where it is and simultaneously transposing the music over a range of eight octaves. The bar graph display has four levels of magnification allowing one to adjust the beginning and ends of notes with a precision approaching one thousandth of a second.

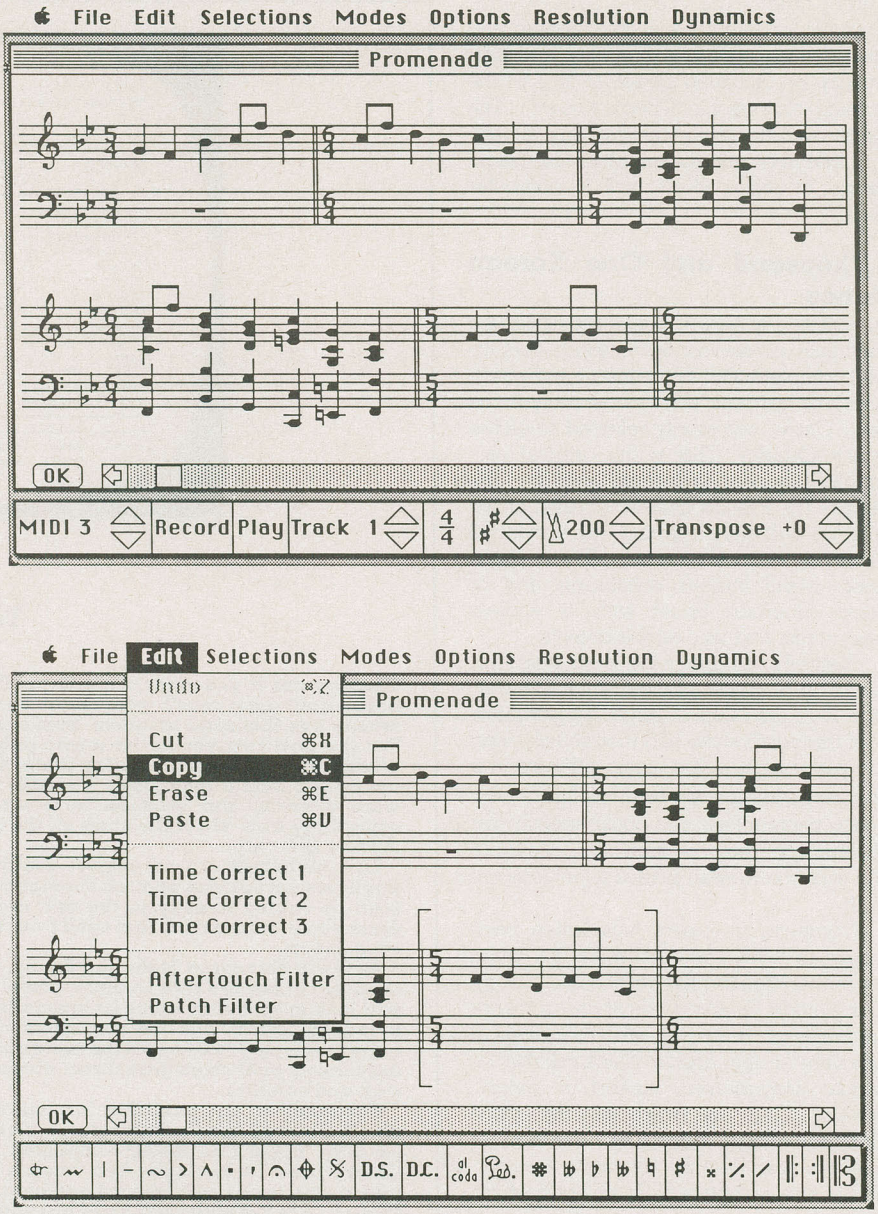
Various tracks can be chained together so that you can work on one verse or section of a song at a time, and link them together for the final performance. Thus individual snippets of music can be saved on disk then called up as required. All the editing is interactive, that is, you hear the changes as they as executed. Finally, the completed composition can be converted to standard music notation and printed out, one track at a time, or many together, on one staff or several, with time signature, key signature and any of seven clefs.

A full library of musical symbols is in the program and you may add symbols of your own. Additionally, the software is compatible with MacPaint for further enhancement.

We had such fun playing with *Total Music* that we totally overlooked the dimming lights of the Rivergate Hall. Day one was over, and we wound our way back to Bourbon Street as a collage of jazz began to permeate the hot spicy air.

New Orleans is the jazz capital of the world. The main street in the French Quarter is Bourbon Street, lined with little clubs and bars where jazz musicians and music lovers congregate nightly until the dawn hours... and in some cases beyond the dawn hours. We were not long wandering in the French Quarter before we became utterly but not unpleasantly lost.

While standing on a corner wondering which of four equally enticing directions to pursue, we noticed that beside us was the most quaintly dilapidated building we had ever seen. It was a small low structure whose walls consisted of angled wooden beams with brick filling in between. There was a simple hand painted sign askew on one corner of the building that read "Visit North America's Oldest Bar". As it turned out the building dated from 1772, and had served in its early years as a blacksmith's shop and a privateer's hangout.



Some screens from the amazing Total Music package.

From a corner of the dim candlelit interior flowed the sound of such an old reluctant piano it could easily have belonged to the original blacksmith. However, mingled in with the wild tuning and broken strings drifted a delicate female voice singing with the most poignant melancholy we had ever heard. Lily, whose personality embodied the entire cavalcade of those two hundred years, was wedded to the Old Blacksmith Shop house pianist seven nights a week. She had lived for many years in Paris, and her lyrics would slide gracefully from one tongue to another.

There are no mandatory closing laws in New Orleans, and we returned several times to enjoy relaxing in this dim candlelit bar at the end of a festive evening.

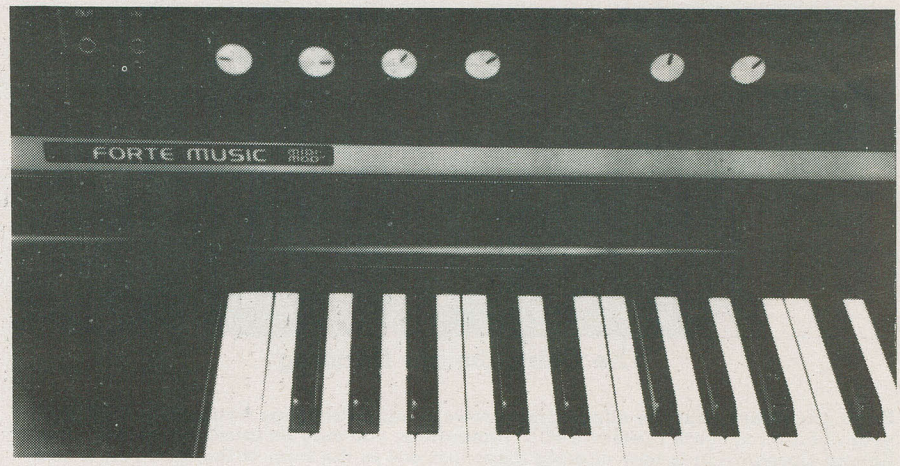
Free Samples

The following morning we were off, this time to the main New Orleans Convention Center. This was the main exhibit building where most of the hardware was on display. Hardware in this sense could mean anything from nine foot concert grand pianos to any of hundreds of drums, guitars, violins, amplifiers... in short anything that could be hammered, strummed, blown or scratched to make a sound. This building presented quite a challenge just by virtue of its sheer size.

Near the far end our perseverance was rewarded: we located the perfect add on for your computer MIDI system, a digital sampling module. Music hardware has been undergoing the same sort of disintegration that occurred with stereo equipment several years ago. Whereas previously, buying a musical instrument usually meant hiring four men and a truck to prepare for its delivery, now one can purchase just the keyboard and use one's existing home stereo and speakers. Various types of sound modules connect to the keyboard and produce the actual musical tones.

Currently, there is a fairly vast number of both analog and digital modules with varying degrees of programmability. Once a sound has been programmed, it can be assigned a preset number and thus activated merely by calling up that number. Depending upon the module's complexity, several presets may be activated simultaneously. This facility is termed 'multi-timbral' and essentially means that one could have, for example, a sax, clarinet, and trombone playing from the same module at the same time.

The on going difficulty has been the accurate synthesis of these sounds. Often the only relationship between a preset marked *saxaphone* and the sound it produced was the fact that the preset was correctly spell-

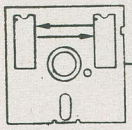


Forte MIDI-MOD Circle No. 56 on Reader Service Card.

There is something very Zen-like about Computer Music. It's not just the logarithmic vibration of the kotos and sitars; it's something intangibly profound in the way computers make all things new. Consider this headline, surely an illumination from the snake devouring its tail: "The best MIDI keyboard you can buy is the piano you already own".

Forte Music is located in a monastery in the Himalayas. When the monks therein are not shuffling about intoning Gregorian Chant, they are installing MIDI outputs for acoustic and electric grand pianos. The Forte MIDI-MOD is an internally installed modification that transforms a regular piano into a touch sensitive MIDI keyboard controller. This gives new meaning to the quip . . . "they laughed when I sat down at the piano and it sounded like a humming bird".

MIDI-MOD is available in Canada under the benediction of Dale Robertson Piano Services, through the Computer Music Centre, Toronto. Telephone (416) 921-8941.



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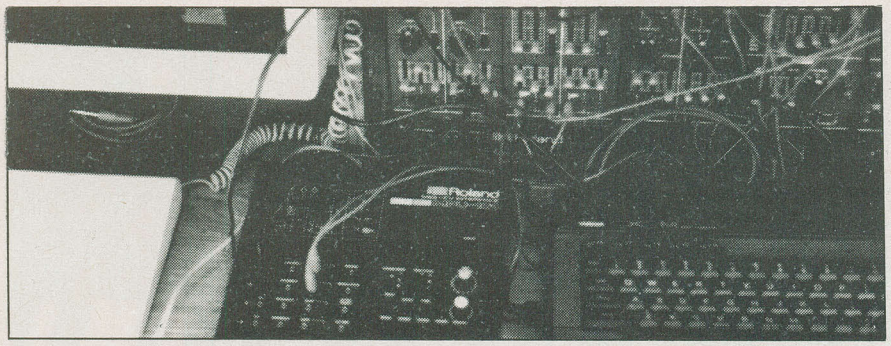


The Cobwebs are Dancing

Having resigned that the slings and arrows of an outrageous fortune have doomed your old analog synth to eternal MIDI damnation, you may be interested to learn that Roland Corporation is now offering dispensations in the form of the MPU-101, a new MIDI to CV (control voltage) interface.

The MPU-101 has four output channels, each with pitch, gate and dynamic control voltage output. Additionally, there are control voltage outputs for bender, modulation, aftertouch and volume. Once these connections have been made to the CV/Gate synthesizer, it becomes a full-fledged member of the MIDI network, and may be triggered from any MIDI sending device.

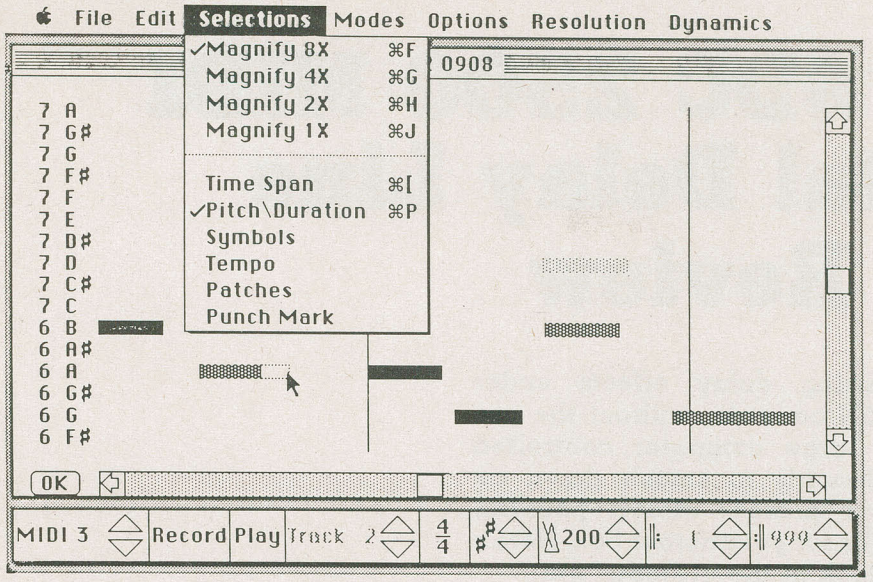
Many of the early analog synths were monophonic, so the four channel limitation of the MPU-101 shouldn't be a problem, yet Roland have thoughtfully anticipated this and provide a MIDI out plug. Data which exceeds the converting capacity of the MPU-101 appears at this output, where it might be processed by an auxiliary MIDI synth. Beyond that, two MPU-101s may be chained together giving a total of eight channels of MIDI to control voltage conversion. The unit can be set to answer any MIDI channel and includes three assign modes and a three range octave transpose. The suggested retail price of the MPU-101 is $395. Circle No. 57 on Reader Service Card.

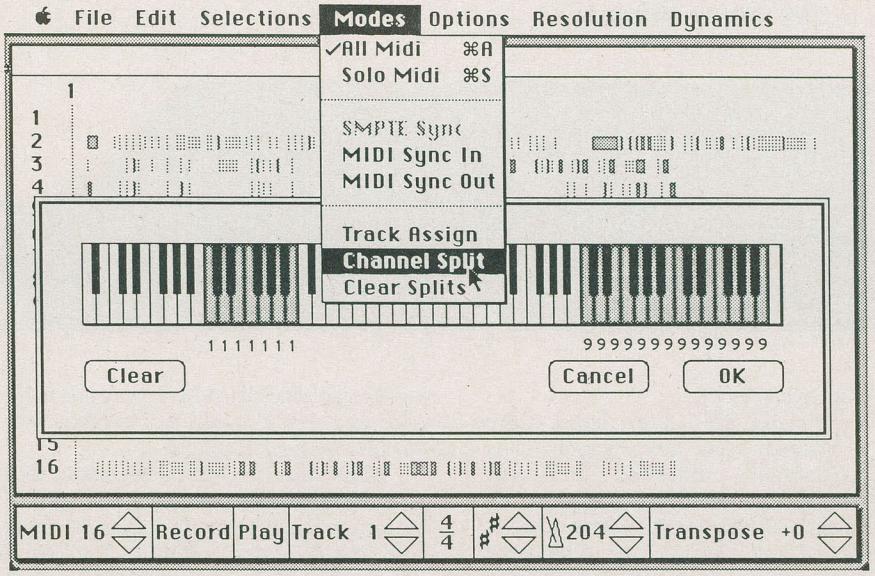
ed. With the advent of high speed processors the idea of actually digitally sampling an acoustic sound became a reality. Thus when you called for the saxaphone preset, you got essentially a digital recording of the real thing.

Enter the Akai S612 digital MIDI sampling module. The S612 is good news for someone who already owns a MIDI keyboard setup and wants access to sampling without adding yet another keyboard. The Akai unit is a nineteen inch rack mount affair that offers up to eight seconds sample time at twelve bit resolution with a frequency response of twenty-five Hertz to twenty kilohertz.

There are two inputs, mic and line, and the recording can be initiated either by triggering it manually or by setting a threshold level on the front panel of the S612.

Once a sound has been stored it can be manipulated in a number of ways. First, there are two start and end point sliders which allow for windowing the intended sound. Interestingly, if the start slider is positioned at the end of the sample and the end slider moved to the start position the sample sounds backwards. Additionally, the sample can be looped, thus simulating a sustained tone.





More screens.

Some care must be taken in setting up the sound input. Ideally the line input should be used if possible, as this eliminates any extraneous sound such as might be present using a microphone. Also, the input level is quite crucial in order to achieve a minimum of quantization noise. If the latter becomes too discernable it can be mitigated by adjusting the filter control on the front panel.

A decay control determines the fall off rate of the sound once a note on the keyboard has been released. The S612 can be played from any MIDI keyboard simply by connecting the appropriate cables to the rear mounted MIDI in, out and through sockets.

Akai has thoughtfully provided three additional controls which activate a low frequency oscillator, controlling its rate, depth and delay. The oscillator helps movement to the sound reminiscent of certain analog effects.

The S612 implements most of the standard MIDI protocol, such as monophonic and polyphonic modes, channel zero through nine receive and transmit, pitch bend and velocity, although aftertouch is not recognized.

Finally, as a means of storing your sampled sounds Akai has announced the Q-Disk, a 2.8 inch rack mount which allows for the storing of two digital samples on a single floppy disk. Akai seems to have a fondness for odd formats...witness the MG1212 twelve track recorder which uses "the world's first" half inch audio cassette tape. In any case, it certainly would be more convenient to download the voice data through the MIDI port. Akai could strike a blow for the cause of the enlightened end user by at least providing an idea of the data structure; that being provided, a screen editor becomes enticingly nearer.

Akai offers a sound disk library for those who prefer to purchase factory presets off the shelf.

All in all, the Akai S612 proved very serviceable for the immediacy of sampling sounds. At a list price of just under fifteen hundred dollars Canadian the S612 is well within the range of the owners of even moderate MIDI systems.

All That Jazz

Leaving the convention center we were just in time to catch the paddlewheeler Creole Queen departing its dock for a cruise up the Mississippi. Under a perfect warm moonlight night we were offered a superb Creole dinner on the promenade deck to the accompaniment of a fine jazz orchestra. Returning shortly after midnight, we found Bourbon Street just hitting its stride.

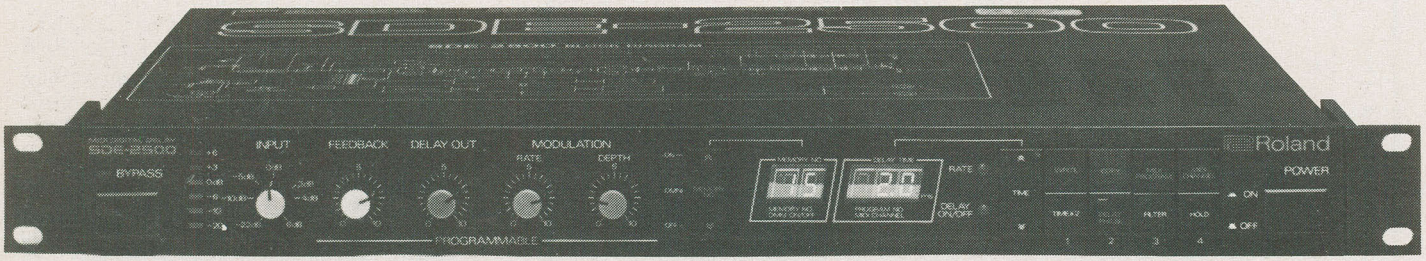
With so much music, and so many clubs, it's very difficult to decide just where to spend one's time. However, through one particular door came an energy, and there was no question of passing it up. Crossing a well worn entrance we entered musical nirvana. The instruments were organ, drums, bass and guitar forming a backdrop for the soloist. Carver has been playing saxaphone for as long as he or anyone else could remember, and he is on in years now. As a man at peace with himself, he waited patiently, almost indifferently, during the band's introduction. Then, as the first note beamed from his tenor, time stopped and the room disappeared. He was not a musician, this was not a performance–this was music, propelled and agitated by the breath of some spirit whose song was not a series of notes but rather a landscape of the soul, an indictment we were commanded to hear.

There was a great deal more at the music convention but much of it pretty generic, or at least rewrites of things that have appeared before. It was however, the strange juxtaposition of so much excellent non-computer music on Bourbon Street against the bright lights and coloured monitors of the convention center that threw things out of sync. **CN!**

Roland SDC 2500 MIDI Digital Delay Line Review

Getting delay effects under MIDI control... without the use of large computer controlled solenoids to smash down on your present effects pedals... calls for yet another box. Here's a look at the ultimate wait.

by Steve Rimmer



One of the things that's really tricky to synthesize... even with one of the latest generation of sophisticated microprocessor based synthesizers... is delay. Effects that are traditionally based on mechanical delays... like reverb springs or old bits of garden hose... or electronic delays, such as phasers and phlangers... still sound a lot more convincing if one takes the output of one's synthesizer and fires it through a couple of effects pedals.

There are those purists who feel that sound doesn't need effects at all. They're the same ones who refuse to put sauce on steak even if they're eating at Ponderosa. There are situations wherein a good dose of automatic double tracking can do a world of good for one's noise. This has, of course, made pop music what it is today. The last actual chord was played in 1983, with all the music thereafter simply being the sound of effects manipulating it.

Simple effects pedals are by their nature limited, a bit sleazy and, perhaps most objectionable, mechanically controlled. In mixing down MIDI based sound if one wants to change an effect using these arcane toys one has to walk over to the appropriate pedal and stand on it at just the right time.

This is very tacky.

The Roland SDE–2500 digital delay line is a superb little box sonically. It is microprocessor controlled and can generate delays ranging from the infinitesimally short right up to a three quarters of a second wait... far too long to be useful for anything. It's controllable in all the ways these things should be, with enough adjustments to allow it to do all of the usual noises and an unlimited variety of your own choosing. Its settings can be stashed in memory and called up in the blinking of an LED. However, what is far more profound about it is that all of its splendor can be controlled through the MIDI bus. It's a MIDI device, just like a keyboard or a drum machine.

Once one has wrapped one's head about this concept the world is one's Oreo.

Delay... delay... delay... delay...

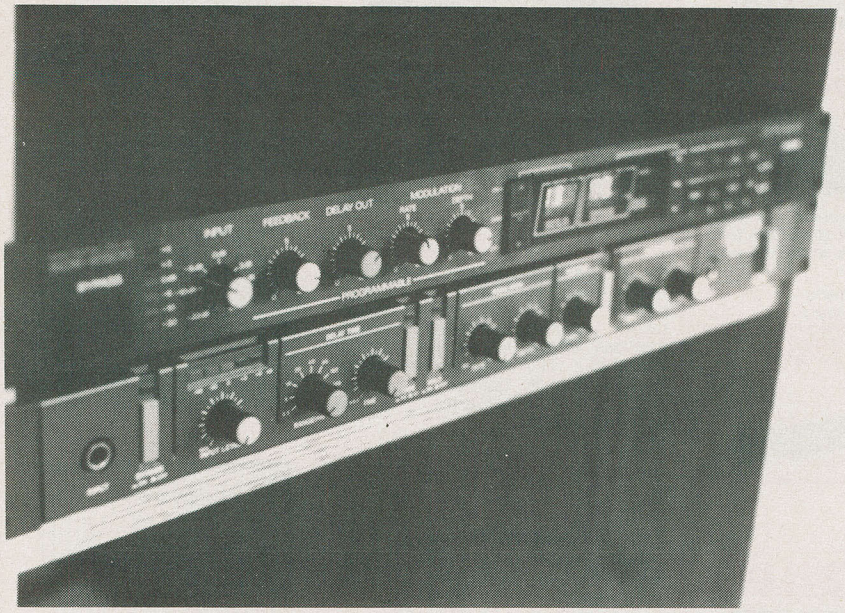
In use one simply sends one's sound through the SDE–2500 and zaps one's MIDI bus into its MIDI connectors. The delay line is then assigned a MIDI channel number through its front panel controls and one can have a MIDI equipped computer talk to it. Allowing that one had an IBM PC running the ubiquitous Personal Composer, the software would send data to the delay line in the same way that it would to a synthesizer it was playing back through.

What makes the MIDI delay line so slick in use is the way it can store information. There are sixty–four memories in there which can be told to record the front panel settings at any time by zapping the *write* key. This includes the settings of the pots, which is quite the trick. When one later calls back a memorized setting the actual mechanical position of the pots is ignored until one is moved.

One can, as such, set up sixty–four effects in the delay line and call them up instantly.

The MIDI bus can also call them up, of course, which is really what makes the system so powerful. One can decide to have, for example, a mild phasing for four bars and a freaky echo for the next four and one's sequencer software can tell the MIDI delay line to switch effects at precisely the right instant.

As with playing a sequencer back through a synthesizer, the delay line allows one to mix down MIDI tracks and experiment with different effects. This, in conjunction with swapping around the voices in a mix is amazingly powerful.



The whole process has a signal to noise ratio of eighty-four decibels, a dynamic range of ninety-six decibels and less than 0.05 percent total harmonic distortion. Numbers are, of course, an illusion... but if you're going to have an illusion you should have a good one.

In addition to all of this there is also a modulation control jack at the back of the box, which allows it to be used with freaky old patch code synthesizers. The control voltage range is zero to ten volts.

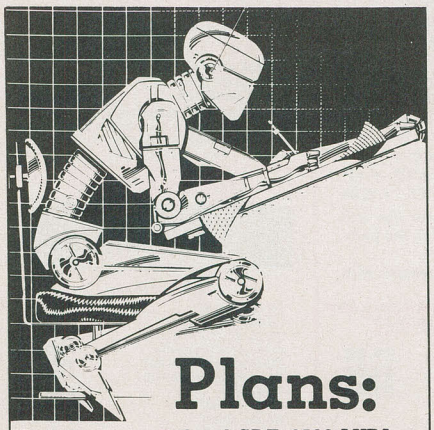
The Waiting is the Hardest Part

While conceptually simple and devoid of any great amount of fiddling potential... you just plug it in and delay... the Roland SDE-2500 is a very powerful MIDI component. It makes a lot of MIDI music sound much more interesting, and gives the composer yet another tool to play with. Being able to manipulate the thing in software is the difference between a civilized mix and a room full of great apes lurching around after a helium filled banana.

I think that everyone should have one and, if I was rich and stupid, I'd buy lots of them and give them out. As it is, I'm poor and intelligent and not altruistic at all... but, I'm well phlanged.

As with so many other really nice boxes, this particular Roland SDE-2500 MIDI shelf bender came from XL Electronix Computer Music Centre, 317 College Street, Toronto, Ontario M5T 1S2, 1-416-921-8941. Ask for Greg and, if he isn't there, he won't talk to you. CN!

Circle No. 58 on Reader Service Card.



Plans:

System:	**Roland SDE-2500 MIDI delay line**
Compatibility:	**All MIDI hardware and software**
Effects:	**Chorus, phlange, phasing, ADT, reverb, hiccups, etc.**
Controls:	**Delay, memory, MIDI - channel, MIDI program, modulation rate and depth, mix, feedback, input**
Delay:	**0 - 750 mS.**
S/N:	**84 dB**
Manufacturer:	**Roland**
Distributor:	**XL Electronix**
Price:	**$765.00**

Equally impressive about the Roland MIDI delay line is its specifications. Some of the digital delay lines that have cropped up in recent years have sounded like very powerful fuzz boxes, blessed as they were with eight bit converters and other pleistocene technology. The Roland box is incredible, with fifteen bit sampling, a seventeen kilohertz bandwidth and delays of anything from nothing up to seven hundred and fifty milliseconds. Even running for the long wait, the sound quality is impeccable.

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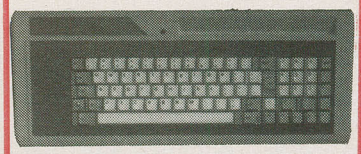

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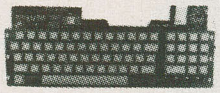

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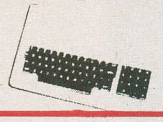

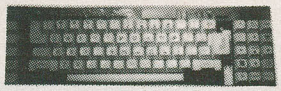

This is a high quality Hall Effect keyboard made by Microswitch of Canada for AES data and now bought by us for 10% of the $169.00 that AES paid for them in 10,000 lots. They are a very good word processing keyboard with both serial and parallel data outputs for use with APPLE and IBM type systems and come complete with a ribbon cable connector and complete pinout. **$24.95**

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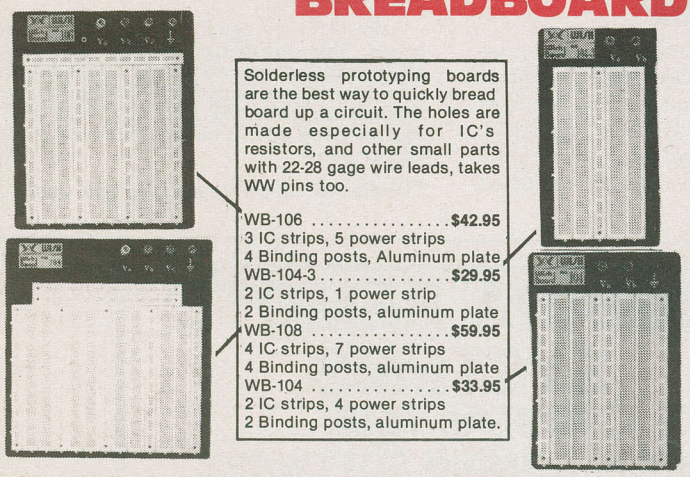

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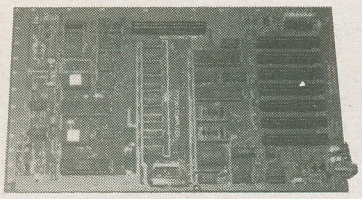

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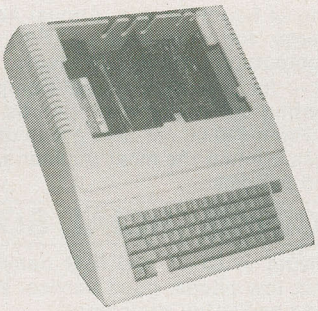

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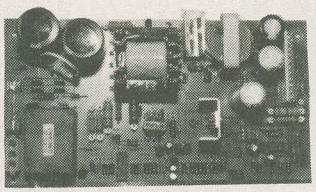

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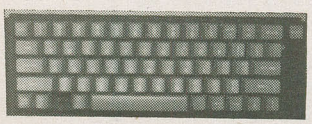

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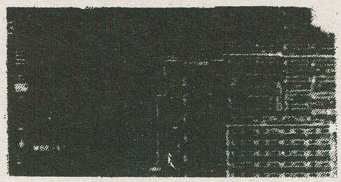

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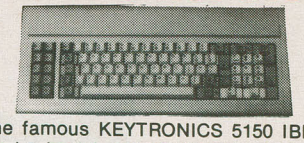

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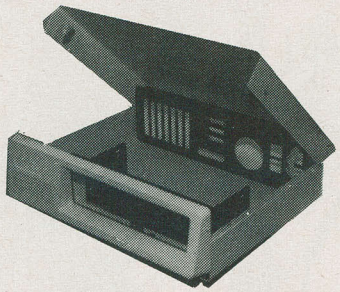

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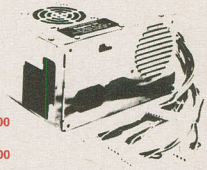

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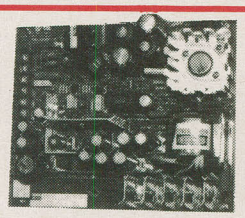

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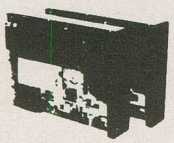

Shugart/Panasonic ½ sizes SA455-3AEC **$169.00**

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- 40 Track per side 48 TPI
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- Same as SA455
- Latest head & drive technology
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Yes we have the same QUME drives that IBM uses in their IBM-XT® system. 40 track, 1/2 height, double sided, double density. The exact ones you need to upgrade your old system or build your clone system up to the max. These are brand new drives that are from QUME's own inventory. They are absolutely perfect, at a perfect price of only **$135.00**

Circle No. 28 on Reader Service Card

Boards of the Rings

Bulletin boards are far more than places to check out the latest version of MODEM7. Here's a look at some of the more interesting ones.

by Frank Lenk

So you're a paid up subscriber to Compuserve, the Source, and InfoGlobe. So you log on regularly to countless mainframes and you're a leading light of the local BBS scene.

So what. That stuff is *tame*.

Let this be a formal invitation for a tour of where the *real* modemites hang out, a look 'round the weirdest and wildest online systems in the world.

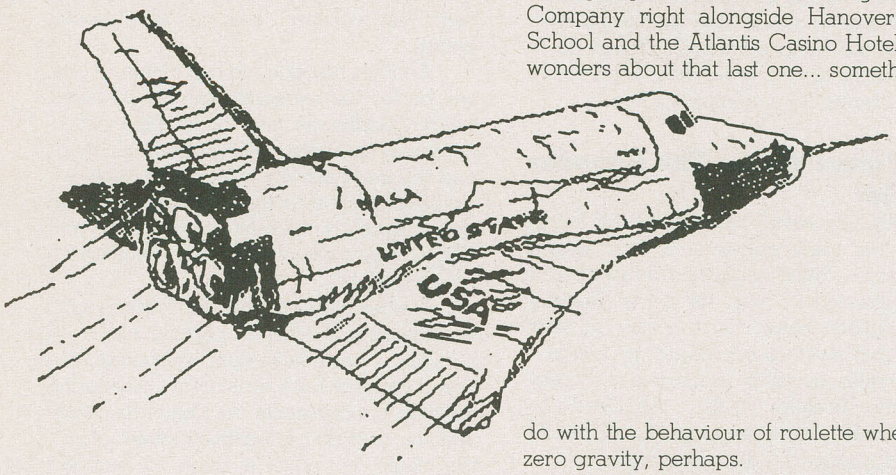
Oh all right. Maybe not the *whole* world... but the Western hemisphere, definitely.

GAS Attack

GASNET is certainly a far out sort of board... literally. To appreciate the truth of this statement you have to know that GAS stands for Get Away Special. Then you'll want to be informed that a get away special is the polite name for a small, self-contained experimental bundle to be hoisted skyward aboard the space shuttle.

GASNET is operated by NASA. The purpose is to provide support to groups preparing GAS payloads. There's a lot of support required, since the GAS modules

have to adhere to some pretty strict criteria. Most of these are laid out in a technical publication, but there are always unforeseen questions.



If you feel the outward urge yourself, you might want to know that GAS payloads are available as follows. Two and a half cubic feet, weighing no more than sixty pounds, sells for three thousand dollars American. The same volume but weighing up to one hundred pounds will set you back five thousand bucks. A five cubic foot, two hundred pound load can be had for a cool ten grand... a bargain, really. I gather from perusing the GAS BBS that most of the experimenters are benefiting from corporate sponsorship.

Considering its antecedents, GASNET in itself is an amazingly pedestrian little system. It runs on a Northstar micro with a mere forty kilobytes of RAM, two floppy drives and a Hayes modem. The software is written in Northstar BASIC. The system is based in Maryland... apparently at the Goddard Space Flight Center... and is administered by two individuals, Bob Pincus and Clarke Prouty.

The command structure of GASNET is conventional. B lists online bulletins. There's E to enter messages and D to delete them. R reads the messages and S scans them. There are some other frills, but we won't go into that.

The bulletins section is fairly well to the point. Its topics include current GAS flight assignments, GAS payload reservations and similarly relevant matters. Peering within some of the files I discovered a very complete description of all the payloads for the shuttle Discovery. These included a radio experiment... built by the MSFC amateur radio club... that was to broadcast test data from the other experiments to amateur radio operators around the world. Another experiment dealt with the germination of radish seeds. Yet another concerned solidification of lead antimony and aluminum copper alloys.

So far thirty-three GAS payloads have been flown, and two hundred and sixty-three users hold reservations for a further four hundred and fifty-one loads. The latter group ranks McDonnel Douglas Astro Company right alongside Hanover High School and the Atlantis Casino Hotel. One wonders about that last one... something to do with the behaviour of roulette wheels in zero gravity, perhaps.

Also listed is somebody named Richard Boudreault, apparently connected with Canadian Astronautics Limited. A fellow countryman, and I've never heard of him. Such is fame, I guess.

Scanning further, one catches glimpses of the GAS process. There's a list of people who have mailed in their payload accommodation requirements... PARs... and are building and testing their payloads while preparing phase three safety documents. If they get through this process, they go on the STS mission queue... whatever that is.

When I logged on there were sixty-nine messages current on the message board... an average number for an average BBS. Their topics ranged from "prelaunch survival time" and "melting alloys" to "penpal messages". One, from CE Williams High School, was an open query about "suitable films for astro photography which are cold resistant and give the best compromise between sensitivity and resolution." I don't recall studying any of this stuff in high school myself.

By the way, message thirty-two or so points out that payloads will sit in the container for between sixty and eighty days before they are actually launched. This would be on top of any specific bureauocratic discouragement to those who figure they could just climb into one of those cans, lock the lid from the inside and really get away from it all.

Cryptical Envelopment

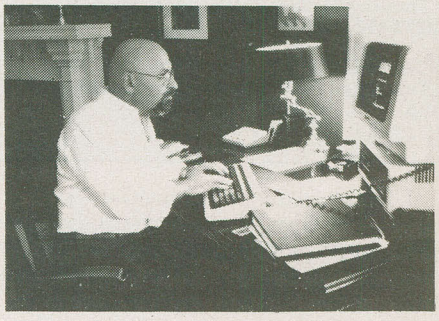
For the more academic of temperament, there's a system run by the International Association for Cryptologic Research, IACR. A standard RBBS system, this one is dedicated to "the exchange of information and programs between professionals working in the field, but it may also be used by the public to ask questions regarding security and privacy, provide feedback to authors, etc".

The next part of the message states that the American International Traffic in Arms Regulations, IATR, "prohibit the dissemination of certain types of technical data, including unpublished cryptologic data, to foreign nationals." That's us, you realize.

I discovered many little tidbits of this kind on the IACR board. For instance, you may not know that the 1984 Symposium on Security and Privacy *will* be held April 30 to May 2.

Somewhat more useful was the suggested reading list. Jueneman highly recommends David Kahn's 1967 book *The Codebreakers*. Be sure and get the hardback edition: it's got all technical background omitted from the paperback. There's also IEEE Catalog Number EH0183 4, *Tutorial: The Security of Data in Networks*, edited by Doctor Donald Davies. That one's fifteen dollars to IEEE members.

One message on the main board mentioned a book by Ledgard, McQuaid and Singer, called *From Baker Street to Binary*. Dedicated Sherlockians please take note.



Other messages on the board were about what you'd expect. One mentioned that Bob Lucas of Trigram Systems, 3 Bayard Road number 66, Pittsburgh, PA 15213 has come up with a very good public domain 8088/8086 implementation of the DES Data Encryption Standard. It is uncertain whether getting this into Canada would need Department of State approval. Another message, apparently posted by a Canadian, quotes the American Office of Munitions Control as stating that DES is specifically excluded from the IATR regulation "by virtue of Section 1.23.12". Your guess is as good as mine. If the FBI comes knocking at your door, don't blame me.

This second message also points out a very typical political situation. Apparently the Canadian regulations under the "export control list" control the export of cryptographic technology from Canada to all countries except the United States. This is good news... we can send them anything we want.

Shrink Tank

If all this trekking through electron land has got you a bit uptight, fear not. Now there's help for the suffering millions... TelePsych,

an online psychiatric service run by Doctor Timothy Miller, PhD, of Stockton California.

I know, this sounds like the craziest idea of the lot, but Doctor Tim manages quite a winning tele-personality, and really makes the system work. As I told him in my parting note, after only twenty minutes or so on the board I felt better already. If this one wasn't so ridiculously distant, as the fruit flies, I'd be on it all the time.

Not that I really need it, you understand.

Table One

The systems

GASNET
Bob Pincus, Clarke Prouty ... MD
(301)344-9156

International Association for Cryptologic Research
Robert R Jueneman, SYSOP
6:30 pm to 7:30 am EST, 24 hrs on weekends
(703) 237-4322

TelePsych
Timothy Miller, PhD ... Stockton, CA
(209)473-8296

Grateful Dead Board
Klaus and Gretchen Bender ... Gettysburg, PA
(717)334-8680

Doctor Miller is scrupulously professional at all times. His opening message not only gives his California medical license number, it even gives you the address and phone of the California Psychology Examining Committee of the Department of Consumer Affairs. Everything is heavily password protected to insure privacy. One of his bulletins, pamphlet ninety-nine, is entitled "why trying to break into TelePsych is futile". Miller does mention that the only exception to the confidentiality rule occurs if you reveal that you are planning to seriously harm yourself or someone else.

Miller has been as ingenious as he has been professional. He solves the problem of how to bill his patients in the following way. You pay a twenty-five dollar deposit to become registered. The doc charges 1.4 cents per word to read your incoming messages... that's about five bucks a page. Mail from Miller to you costs four cents a word, but only if you decide to accept the message by reading it. After your original deposit is exhausted you can run up a balance of another fifteen dollars, after which aid will be cut off until you come through with some more dough.

This may sound mercenary the way I say it, but coming from Doctor Miller it sounded very fair. All the money matters are clearly set out up front.

It really is impossible for me to do this board justice in a few short paragraphs. Miller has a selection of pamphlets online relating to various topics of heavy interest, including male and female sexual problems, depression, anxiety... even computer addiction. I won't quote from these, for fear of being accused of misquoting and dispensing rash second hand advice. All I can do is reiterate: the doctor writes well, and I really did feel better for scanning his board.

The Faster We Go The Rounder We Get

Naturally, I've saved the best for last. Lurking in the back pages of a little known periodical... Relix magazine... I discovered the existence of... wait for it... a Grateful Dead bulletin board. In this day of rock bands that seem to reproduce by fission... breeding like hepatitis germs on a rusty needle... the Grateful Dead... 'the Dead', to their friends... have simply got to be the only band to spawn a dedicated BBS.

In case you didn't know... and you probably didn't... the Grateful Dead have long operated a hot line phone, with a recorded message announcing upcoming tour dates. This is the only advertising the band does, although it is on tour year round... making two complete sweeps of the States every year and selling out virtually every hall it plays.

It was only a matter of time before this sort of service went digital. However, the present BBS is unaffiliated with the official Dead organization, operating through the good graces of Klaus and Gretchen Bender and a Commodore 64. Klaus, an engineer with the Federal Communications Commission, acquired the Commodore largely in order to catalogue his swelling collection of concert recordings... taped by legions of faithful Deadheads and traded like baseball cards. The BBS was a recent inspiration, but has now been up for over three months. It will be going to twenty-four hour operation starting the first of August.

By the way, the FCC also had a need for some computing power. Klaus put in a good word, and now the FCC's frequency allocation system runs on a Commodore 64 too.

Why a Grateful Dead bulletin board? There are many good reasons, and I discovered one of the best almost as soon as I logged on. Going into the to chat mode, I learned that Klaus had spare tickets for the next Dead concert... sold out, alas, months before.

Another function, as I've hinted above, will be for the exchange of concert tapes. Many Deadheads now boast tape collections reaching into the hundreds of hours, and will trade fiercely to fill in any gaps. It is no exaggeration to say that every concert ever played by the band in its twenty year history has been preserved... somewhere, by somebody.

Besides listening to music, I also found a considerable interest in playing music. A number of users have been swapping song chord patterns back and forth. Considering the wild arrangements of some of the songs and the scarcity of legitimate sheet music, this could be quite a boon to budding talents.

Klaus is doing very well in posting current concert dates... complete with recommended local accommodation and other facilities. The user response reflects his care and attention. Although he's been getting no more than three to four calls a night, these have come steadily and from all over the States. I myself had the honour of being his first international caller.

There's no better way to close than to repeat Klaus' sign off quote.

"Once in a while you get shown the light
In the strangest of places
if you look for it right."

CN!

Almost Free PC Software

You can get bored of Lotus 1-2-3 after a while . . . some of us can do it almost before it boots. You can also get bored of WordStar, SuperCalc and AutoCAD. BASIC has enormous possibilities for boredom, while dBase III has been described as being one of the most potentially boring bits of software since the first release of CompuStiff's famous Grave Digger's Database. We won't even get into accounting packages.

Commercial software can be stupendously, tediously, mind numbingly boring unless you have little utilities, patches, fixes and other synthetic trolls to keep your computer partying. This is, of course, why there is Almost Free Software.

In this, the fourth volume of Almost Free Software for the PC, we have rounded up a large collection of patches, games, utilities and business programs than ever before. This single disk contains no fewer than twenty eight unique programs . . . and, of course, no more than twenty eight unique programs. It's the nature of numbers to be dogmatic.

BACKSCROLL Possibly one of the cleverest DOS utilities, Backscroll hooks itself into the PC and buffers whatever scrolls by. Using a very well thought out command structure it allows one to scroll back and forth through text which would normally have scrolled off the screen into oblivion.

BIGCAL is a BASIC program which performs calculations on extremely large numbers. It handles data in floating point form, rather than in scientific notation, which allows for many places of accuracy.

BUGS is a weird little ASCII game. Using the cursor pad one zaps a nuclear fly swatter around the screen blowing up this long crawling bug. It's a scream.

CLOCK is a useful tutorial in writing character oriented device drivers for the PC, as well as being an improved replacement clock.SYS file for many real time clocks. The ASM file is included.

CRYPTO is a BASIC program which descrambles cryptograms. It's an interesting study for puzzle freaks.

DEFRAG is a utility that will allow you to "defragment" your disks and make your applications generally run a lot faster. It re-organizes a disk, connecting up the fragments of files created by DOS.

DOSEDIT is one of the most useful DOS utilities available. It enhances the command line editing facility of MS-DOS by creating a command stack. Now, rather than just being able to recall the last command with F3 the cursor arrows allow you to scroll through a whole stack of previous commands, re-executing the ones you need.

DUMP is a program to produce hex dumps of object files. It's both useful in its own right and a good example of how to use the DOS disk service calls. The ASM file is also included.

FREE is a very tiny file that tells you how much free space you have on a disk . . . without watching a whole directory listing scroll by. It's especially handy on hard drives.

KBFIX displays the status of the keyboard lock keys on the screen and makes the keyboard's character buffer longer to avoid losing bytes.

LABEL changes the labels on drive volumes. It's a simple thing, but useful if you use the labels to keep track of your disks.

LIST is an improvement over TYPE. It shows you the contents of a file with paging, and in a much more civilized fashion.

MEMBRAIN is the most sophisticated RAM disk program we've seen yet. It allows for variable sized disks and a number of other parameters.

MONOCLOK is a screen clock displays program to work on PCs with monochrome displays.

MOVE is a program which moves and optionally erases files. However, you can have it query you about wild cards, such that you don't have to move all the files specified by a wild card. It's very useful.

NEWBELL is a tiny germ of code which changes the sound of the PC's control G beep. It's almost useless, but it's very small.

NUSQ is a file unsqueezer. It's a particulary useful for people who download squeezed files from bulletin boards and need a way to get them unsquozen.

PARCHK is trap to keep the system from locking up and saying "parity error" every time one of these little nasties comes down. It gives you the option of finding out what caused the error and recovering from it.

PURGEDUP is a very sophisticated program for killing off obsolete backup files. It's of great use on a hard drive . . . which tends to get filled up with abandoned files quite easily.

PX is a cross reference generator for assembler programs. It helps you keep track of where you put procedures in large files.

QS is a DOS patch which eliminates the wait one normally experiences while the PC checks out its brains prior to booting. It's not compatible with everything, but it's still extremely handy.

SDIR is an improved sorted directory program.

SP is a very clever print spooler. It will allow you to print files into a RAM buffer and have the PC send them to the printer in the background while you move on to other things.

SPACEINVADERS This a bit of variation on the popular arcade game, but it's fast and the graphics are superb. Green blood will ooze from your drives.

SPEED is a very simple program which changes some of the PC's floppy disk parameters and effectively speeds up the disk accesses for some applications.

VDEL is a multiple file deletion program that queries you prior to snuffing each entry. It's a bit like MOVE but it's much smaller.

WHEREIS will locate a file on a disk even if it lurks in a subdirectory. It's primarily useful on hard disk systems.

WIZARDS is an adventure game in the classic style . . . except that it is easily the most sarcastic program in creation. It's profoundly huge . . . you can wander about its darkened corridors for hours.

This disk, with all of the programs listed here plus the appropriate documentation files is available for a mere

$19.95

plus seven percent Ontario sales tax

Almost Free PC
Moorshead Publications
25 Overlea Boulevard
Suite 601
Toronto, Ontario
M4H 1B1

or, if you want to be high tech you can order by phone. Call

1-416-423-3262

during business hours. Have your VISA, Mastercard or American Express card handy.

Fine Print: This software has all been collected from public bulletin boards and is believed to be in the public domain. The fee charged for it is to defer our cost in collecting it, testing it and putting this collection together, and for the cost of the media and its handling.

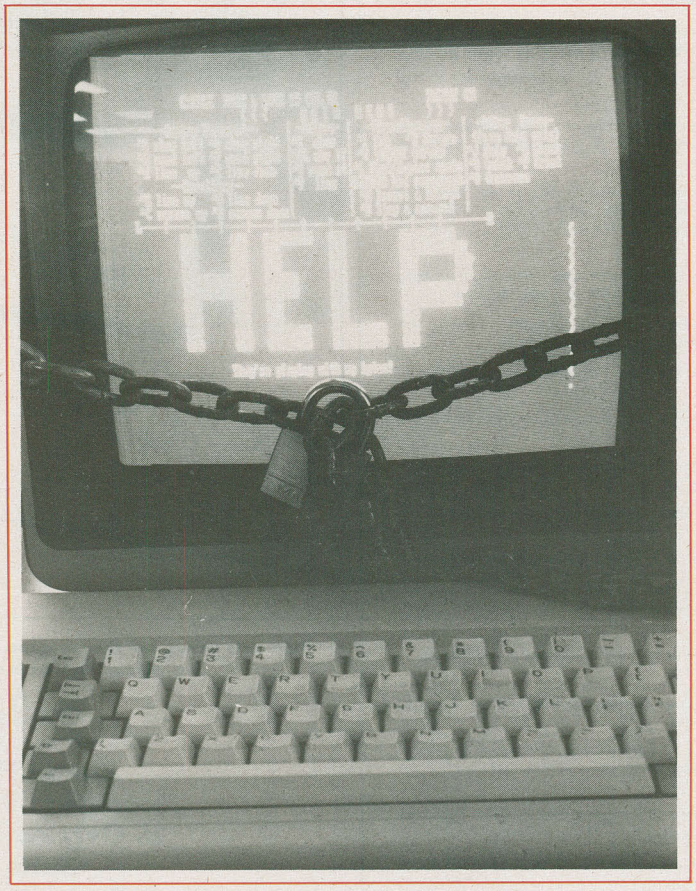
While we have endeavoured to make sure that this software does what it says it does, and while it has exhibited no bugs while we were using it, it is possible that some of it may not function properly on some PC compatible systems. We are unable to assist you in modifying this software for your applications.

Moorshead publications warrants that the disk you receive will be readable. However, the post office may have other plans. If you are unable to read your disk please return it to us for replacement.

Absolute Domination IBM PC WordStar

Get out some tall, nasty looking boots and put on a really evil expression... we're going to have the IBM PC version of WordStar cowering at all the feet it can find. It'll do all the things you always wanted it to do... all you have to know is where to patch it.

by Steve Rimmer



When it's really humble and submissive... and completely receptive to your every whim and desire... WordStar can be quite a useful tool. In fact, if you get it to the state where it just follows you around on its hands and knees, pleading for the merest whisper of things that will please you, it can really become an extension of your fingers, transforming your thoughts into text with effortless grace.

You may not be familiar with the potentially menial nature of WordStar if you're using the stock version. In fact, WordStar as it first comes from the crate isn't what you'd call all that co-operative. One might say that it's considerably inflexible, insisting on doing things its own way. You can bend its will considerably, however. All you have to do is to find out what to tickle and how long to keep it up before the little trog will break down and agree to anything.

I've long regarded slimy old WordStar as being the best choice among word processors for pretty well everything I do with text. There are pots of other packages, but

most of them involve tradeoffs that WordStar makes a lot more intelligently. However, a lot of what makes WordStar work for me is involved in the patches I've laid on it. While the slavering three eyed nether trolls of MicroPro's programming dungeons never saw fit to mention it in the manuals, WordStar was written to be manipulated and adjusted so as to optimize it for the preferences and applications of its users.

In this feature we're going to look at the internal structure of the IBM PC version of WordStar with an eye to messing with its works.

Shooting Stars

The first thing that's useful to know about adapting WordStar is that you really won't be doing anything particularly freaky when you're at it. WordStar was designed to be altered by the INSTALL program and the variety of patchers that MicroPro has coughed up. The same stuff that these programs use is available for mere humans such as ourselves to play with if only we can locate it.

In order to successfully meddle with WordStar you will need a copy of PC WordStar 3.30 and its overlays. Make sure that you are using a *copy*... you will have every opportunity to trash the thing, and it would be very uncool to do this to your original master. You may have to improvise a bit if you are using a version other than 3.30, but you'll find that most of the addresses and other stuff in this feature are common to all PC WordStars.

You'll also need the DEBUG program. For the uninitiated, this is a thing which allows you to take an object file... that's what the bald guys in the lab coats refer to WordStar as... and change bytes within it. It's the ideal beast for this sort of thing, although the syntax and general operation of it are a bit Martian nouveau.

The fundamentally handy thing about patching WordStar is that all the stuff that one would sensibly want to patch is located in two tables, which we'll call the control code table and the flag table. The first of these things intercepts control characters, or combinations of control characters, and executes routines within WordStar that do whatever the control characters are supposed to make happen. Thus, for example, if you hit control B, to reformat a paragraph, WordStar will look up control B in the control code table, find the corresponding address of the paragraph reformatting routine and go do it.

The flag table is even easier. It holds the status of all the toggles, the help level, the number of lines on the screen and so on. When you boot up WordStar, for example, it will check out the location that holds the help level. If the number there is less than three it won't show you a menu while you're typing. If you hit control J and H you will be able to enter a number which will wind up in this location, altering the help level.

The first important thing to know about these tables, then, is where they are. The first useful byte in the flag table is at 0248H, while the control character table starts at location 0481H. These are, of course, nasty hex numbers. However, don't let this worry you. You won't have to do anything particularly weird with hex.

If wandering Hs don't frighten you, even when they creep up from behind and howl about segment offset addresses in the night, you might want to skip this next bit. For everyone else there follows a brief look at how to work the DEBUG program as it pertains to patching WordStar.

To get started, we have to get DEBUG going and get it to inhale WordStar so that it can be patched. Assuming that WordStar is called WS.COM on your disk, type

```
A►DEBUG WS.COM
```

This will leave you with a dash for a prompt.

Debug has a number of commands which aren't really applicable to what we're up to here. The only two you'll have to do anything much with are E, for edit, and W, for write, the latter being used to put the changes you make to the WordStar you have in DEBUG back into your disk file so they'll become a permanent part of your life. The Q command, for quit, is also handy as it will get you out of DEBUG when you're done so you can try WordStar and see what you've wrought.

All of the numbers that get entered into DEBUG are in hexadecimal. There isn't a lot you can do about this, unfortunately, but, then, all the numbers in this article are also in hex, so it shouldn't be too bad. You might want to check out the "Hexes and How to Throw Them" article in the June 1984 edition of Computing Now! if hex is a complete mystery for you.

The edit command of DEBUG will allow you to see what individual bytes of WordStar are holding and, optionally, to alter them. Let's begin with a really simple patch. We're going to change the aforementioned initial help level so that WordStar boots up set to help level two, with no menus showing when you are typing unless you call for one.

The initial help level value is in the flag table at location 0360H. You would type

```
-E0360
```

and DEBUG would respond with

```
0896:0360 03.
```

Now, the first thing to understand is what all this means. The 0896 before the colon is the segment address WordStar is presently occupying. It may be different on your machine. In any case you should bear in mind that, vitally important and interesting that this is to your computer it's utterly meaningless for this procedure and can be politely ignored. The next number, the one after the colon, is DEBUG confirming the address you typed in. This is important, because if DEBUG managed to get confused and showed you the wrong byte you could patch something critical in WordStar in a way it didn't take kindly to and fry it out.

The third number is the current value at the location you specified, in this case three. This is the current initial help level. If you were to type in 02 at this point the three would be changed to two. You can repeat the E0360 command to see if this has actually happened.

In patching WordStar with DEBUG, especially if you are patching a version other than 3.30... which may not have everything at exactly the same addresses as I've used for the examples in this article... it's important that you think about what's going down. If you go to edit a byte and its current value doesn't make any sense... if the help level had been several hundred, for example... you'd probably have the wrong location.

All Flags Flying

Let's begin with a serious patch of the flag table. The control character table is a bit trickier, so we'll get to it in a moment. There are quite a number of useful flags to meddle with... they're detailed in table one.

When you first unpack WordStar it does a lot of things that you'll eventually grow to be weary of. For example, it insists on showing you a line at the bottom of the screen that holds abbreviations for the contents of the PC's function keys. This is a drag once you know what they are and, as such, you might want to kill this line.

The line exists because MicroPro has tricked WordStar into thinking that it actually has one fewer line of screen display than it actually does. As such, it doesn't go cheerfully overwriting this line whenever the cursor reaches the bottom of the screen. It scrolls just before it gets there.

You can untrick WordStar by simply telling it how many lines it really has. The pertinent byte is the first one in the flag table, at 0248H. If you look at this under DEBUG you will see that it holds the value 18, which is actually twenty-four in decimal. If you make this 19, or twenty-five decimal, the function key line will be gone when next you boot WordStar.

Another trip with WordStar is the delays it uses for its menus. If you were to hit control Q and P, for example, quickly enough, the menu wouldn't appear at all. However, speed is of the essence, because the time you have to get your fingers flying across the keyboard is quite short. If you have a PC compatible that runs at a higher clock speed than does the authentic blue you'll probably find that the delay is almost

Table One

The useful patch points in the flag table.

0248	80	Number of lines on the screen
0284	02	Highlighted text and background colour
028B	0B	Normal text background colour
02D1	08	Time to wait for menus
02D2	10	Time to wait for messages
02DC	01	Default drive
0360	03	Initial help level
0362	FF	Insert mode (normally on)
0363	FF	Show the directory (normally yes)
0385	FF	Word wrap (normally on)
0386	FF	Right justification (normally on)
0387	FF	Veri-tabs (normally on)
0388	00	Soft hyphens (normally off)
0389	FF	Hyphen help (normally on)
038B	FF	Show the ruler (normally yes)
038D	FF	Show page breaks (normally yes)
038E	01	Line space
0392	00	Document mode (FF for non-document)

negligible. You can change the delay by increasing the value at 02D1H. You'll probably have to play with this number a bit to find a delay that suits you.

If you like to write machine language programs or do other things that require straight ASCII files... that is, if you use the N mode a lot, you might want to create a special version of WordStar which comes up in the N mode automatically. Having done this, you could edit a text file by typing

```
A►WS PROGRAM.ASM
```

and have WordStar blast you right into N mode with your file staring out at you, scooting past the main menu entirely.

The pertinent location is 0392H, the non-document mode flag. This contains a typical WordStar toggle. A value of 00 is considered to be "no" while FF is "yes". There are a number of these things in the flag table.

There are several toggles that you might want to manipulate. Hyphen help, at 0389H, for example, is one of the things I really despise and take great pleasure in toggling off. If you despise it too you can set it to 00. If you write letters or do other manuscripts that don't look cool with right margin justification you might want to kill this as well. It's at 0386H.

You may have noticed that when you hit the tab key the cursor normally moves over five spaces. In fact, WordStar generally doesn't insert real tabs into your text files... it just pads things out with spaces. The tab positions are shown by exclamation points on the ruler at the top of the screen.

There are instances wherein you'd probably rather have real tabs, which move in fixed increments of eight spaces. One of the nice things about actual tabs is that when you backspace over one the cursor moves back eight spaces all in one shot. If you'd rather have real tabs, toggle the veritabs, at 0387H, off.

If everything you type is double spaced you can save yourself having to change the space setting every time you boot WordStar by patching it. It lives at 038EH... it's normally one.

I find that a black screen with coloured characters is a much easier thing to look at than is one that shines at you like some sort of high tech desk lamp. The authors of WordStar obviously felt otherwise... because they felt moved to make the work area bright blue. This turns my eyes into pumpkins if I look at it for a while and, as such, I have found this worthy of changing.

The pertinent locations for the screen colours are 0284H for the highlighted text... menus and stuff that gets blocked off... and 028BH for everything else. These are little tricky to use, however, because you have to calculate their values. Each of these bytes contains the colour codes for *both* the background and foreground colours.

The colour code values on the IBM PC go like this.

Black	**0**	**Blue**	**1**
Green	**2**	**Cyan**	**3**
Red	**4**	**Magenta**	**5**
Brown	**6**	**White**	**7**
Grey	**8**	**Light blue**	**9**
Light Green	**A**	**Light cyan**	**B**
Light red	**C**	**Light magenta**	**D**
Yellow	**E**	**Bright white**	**F**

If you think of the byte as being two hex digits or, to make things a bit simpler, two characters, the foreground colour will always be the right character of the pair and the background the left character. Thus, for example, if you wanted the menus to come up as cyan characters on a red background... don't, it's relatively ugly... you would change location 0284H to 43. That's four for red and three for cyan.

You can meddle with the flag table to your heart's content. While you can create some pretty bizarre versions of WordStar this way, you can't really do any serious damage to it and you can generally unpatch anything you do.

You should also keep in mind that most of these toggles and settings can be changed once you're into WordStar. Thus, just because you patch the hyphen help off doesn't mean that you can't change it later with the control O menu just like always.

Loosing Control

The control code table is a bit livelier than the flag table. For one thing, if you make a mistake in manipulating it WordStar will probably behave unpredictably. However, by altering it one can make the way WordStar relates to the PC's keyboard a bit more human.

The control code table consists of a string of four byte entries. Each entry consists of two bytes for the control code... or code combination... followed by two bytes that are the address of the part of WordStar that does whatever the control code represents.

In the case of, say, control X, which moves the cursor down the screen, the second byte is 00, which WordStar ignores. The complete entry for the control X position in the table is

```
18 00 FE 7E
```

The 18 byte is a control X. This is twenty-four in decimal... yes, it is karmic how the same numbers keep turning up... and X is the twenty-fourth letter. The bytes FE 7E represent the address 7EFEH in WordStar, which is where the routine to move the cursor down lives.

In to order change what some of the keys in the table do we have to change the addresses in their entries to the addresses of the routines we want to be executed when they're hit. Now, you may well ask how one finds out where the routines live in WordStar... and well you should. In fact, these addresses aren't written down anywhere *per se*, but they are inferred in Wordstar itself.

Since each control code has an entry in the table, each control code has a corresponding address for the routines that will handle its function. When you know what the control codes do... they're all explained in Wordstar's manual... you can figure out what each address in the table points to. As such, we can fairly easily discern the addresses of the routines that handle each function.

In fact, it's rarely necessary to map out every routine. You can go and work out the addresses for the ones you need while you're patching the code. It is helpful to know where the table entries live, however... there's an exhaustive list in table two in this feature.

Let's start with a really obvious patch to get the hang of it. In order to backspace over a character and rub it out one must normally use the delete key on the PC's keyboard, which is inconveniently placed. It would be a lot easier if one could use the backspace key instead, but this generates a control H, the non-destructive backspace.

There is a bit of an inconsistency in the rational of WordStar, inasmuch as both the control S and control H keys do exactly the same thing, to wit, moving the cursor left. No one actually uses the control H key, and, as such, making WordStar do a destructive backspace whenever it sees a control H... either from the control H key or the backspace key... shouldn't be much of a hassle. You can do this by finding out the address of the routine called by the destructive backspace key and putting it in place of the address called by the control H key.

Table Two

The control code table

0481	11 FF	Control Q for menu
0485	0B FF	Control K for menu
0489	0F FF	Control O for menu
048D	0A FF	Control J for menu
0491	0A 08	Set help level
0495	13 00	Control S - cursor left
0499	08 00	Control H - cursor left
049D	04 00	Control D - cursor right
04A1	01 00	Control A - cursor left word
04A5	06 00	Control F - cursor right word
04A9	18 00	Control X - cursor down
04AD	05 00	Control E - cursor up
04B1	11 13	Control QS - cursor far left
04B5	11 04	Control QD - cursor far right
04B9	11 18	Control QX - cursor bottom
04BD	11 05	Control QE - cursor top
04C1	11 42	Control QB - cursor start of block
04C5	11 4B	Control QK - cursor end of block
04C9	11 50	Control QP - cursor last position
04CD	11 56	Control QV - last search or move
04D1	11 30	Control Q0 - cursor to marker 0 through
04F5	11 39	Control Q9 - cursor to marker 9
04F9	11 12	Control QR - cursor to top of file
04FD	11 03	Control QC - cursor to end of file
0501	11 06	Control QF - find text
0505	11 01	Control QA - search and replace
0509	11 0C	Control QL - find Spellstar marks
050D	0C 00	Control L - repeat last command
0511	11 17	Control QW - scan down
0515	11 1A	Control QZ - scan up
0519	1A 00	Control Z - scroll up
051D	17 00	Control W - scroll down
0521	12 00	Control R - page down
0525	03 00	Control C - page up
0529	7F 00	Del - destructive backspace
052D	1F 00	Control dash - destructive backspace
0531	07 00	Control G - yankback
0535	19 00	Control Y - snuff a line
0539	11 7F	Control Q del - delete left
053D	11 1F	Control Q dash - delete left
0541	11 19	Control QY - delete right
0545	14 00	Control T - yankback word
0549	16 00	Control V - insert toggle
054D	02 00	Control B - reformat
0551	11 11	Control QQ - repeat
0555	0E 00	Control N - new line
0559	09 00	Control I - tab
055D	0D 00	Control M - carriage return
0561	10 00	Control P - insert control code
0565	0B 08	Control KH - hide markers
0569	0B 42	Control KB - start of block
056D	0B 4B	Control KK - end of block
0571	0B 30	Control K0 - set marker 0 through
0595	0B 39	Control K9 - set marker 9
0599	0B 16	Control KV - move block
059D	0B 03	Control KC - copy block
05A1	0B 19	Control KY - snuff block
05A5	0B 0E	Control KN - column move toggle
05AD	15 00	Control U - interrupt operation*
05B1	0B 18	Control KX - save and quit
05B5	0B 04	Control KD - save and main menu
05B9	0B 13	Control KS - save and continue
05BD	0B 11	Control KQ - abandon
05C1	0B 12	Control KR - read in file
05C5	0B 17	Control KW - write file
05C9	0B 0A	Control KJ - kill file
05CD	0B 06	Control KF - directory toggle
05D1	0B 10	Control KP - print a file
05D5	0B 0C	Control KL - log in new drive
05D9	0B 0F	Control KO - copy file
05DD	0B 05	Control KE - rename file
05E1	0F 0C	Control OL - set left margin
05E5	0F 12	Control OR - set right margin
05E9	0F 09	Control OI - set tabs
05ED	0F 0E	Control ON - clear tabs
05F1	0F 06	Control OF - set margins and tabs
05F5	0F 17	Control OW - word wrap toggle
05F9	0F 0A	Control OJ - justification toggle
05FD	0F 16	Control OV - varitab toggle
0601	0F 04	Control OD - print display toggle
0605	0F 14	Control OT - ruler toggle
0609	0F 10	Control OP - page break toggle
060D	0F 05	Control OE - soft hyphen toggle
0611	F 08	Control OH - hyphen help toggle
0615	0F 07	Control OG - paragraph tab
0619	0F 18	Control OX - release margins
061D	0F 03	Control OC - centre
0621	0F 13	Control OS - set line space
0625	0A 04	Control JD - dot help
0629	0A 13	Control JS - status help
062D	0A 06	Control JF - flag help
0631	0A 10	Control JP - market help
0635	0A 02	Control JB - reformat help
0639	0A 0D	Control JM - margin help
063D	0A 09	Control JI - command help
0641	0A 16	Control JV - block move help
0645	0A 12	Control JR - ruler help

*don't mess with this one.

Let's start by getting the address of the destructive backspace. The entry in the control code table... as found here in table two... starts at 0529H. The first byte is the key code... 7F... the second is a 00 and the next two are the address. In the case of WordStar 3.30 these are AE 83.

Now, the table entry for the control H code is 0499H. The first two bytes are the character and its 00. The next two, at 049BH and 049CH respectively, are the address. Change these to AE and 83. The backspace key will now function as a destructive backspace.

You can change the functions of any of the keyboard keys you feel like mutating using this table. However, one catch to this is that the menus which describe the functions of the keys aren't changed by this procedure. As such, the information in them will be somewhat erroneous unless you can find the pertinent bits of the WSMSGS.OVR file and change them too. This latter bit is a party of the first magnitude, and one which you might want to leave for another time.

The control code table also allows you to change how WordStar behaves in regard to its commands. You can, for example, turn single stroke commands that might be a bit destructive into double stroke commands. The entry for deleting a line, at 0535H, shows a single control Y as its code. If you change the 00 after this to a second control Y you will have to hit two control Ys to wipe out a line. A control Y and any other letter will be ignored.

The one I changed immediately was the control V insert mode toggle. This is very easy to hit without noticing it, causing one to inadvertently wipe out text when one thinks one is pushing it before one's cursor.

A Patch of Sky

There are, not surprisingly, countless patches you can lay on WordStar to make it a better slave. We've looked at some of the more useful ones here, but there are plenty more. If you get really hot with DEBUG you might want to see what else you can find.

We'll look at some more patches in an upcoming edition of Computing Now!.

Having gained the ability to customize WordStar for your specific applications you can, of course, create lots of specialized WordStars, each one set up to default to the things you need for that task. This saves one a lot of time and keystrokes. Making WordStar bow and quiver at your very approach is, of course, a decent power trip if you've previously only been able to browbeat Toyotas. For the more domineering, it's a useful way to get this already powerful slab of software to really kick off its gum boots and boogie.

You've probably never seen WordStar really get down and dance, its bytes flying wantonly in the sultry night air. It's the stuff of poetry. **CN!**

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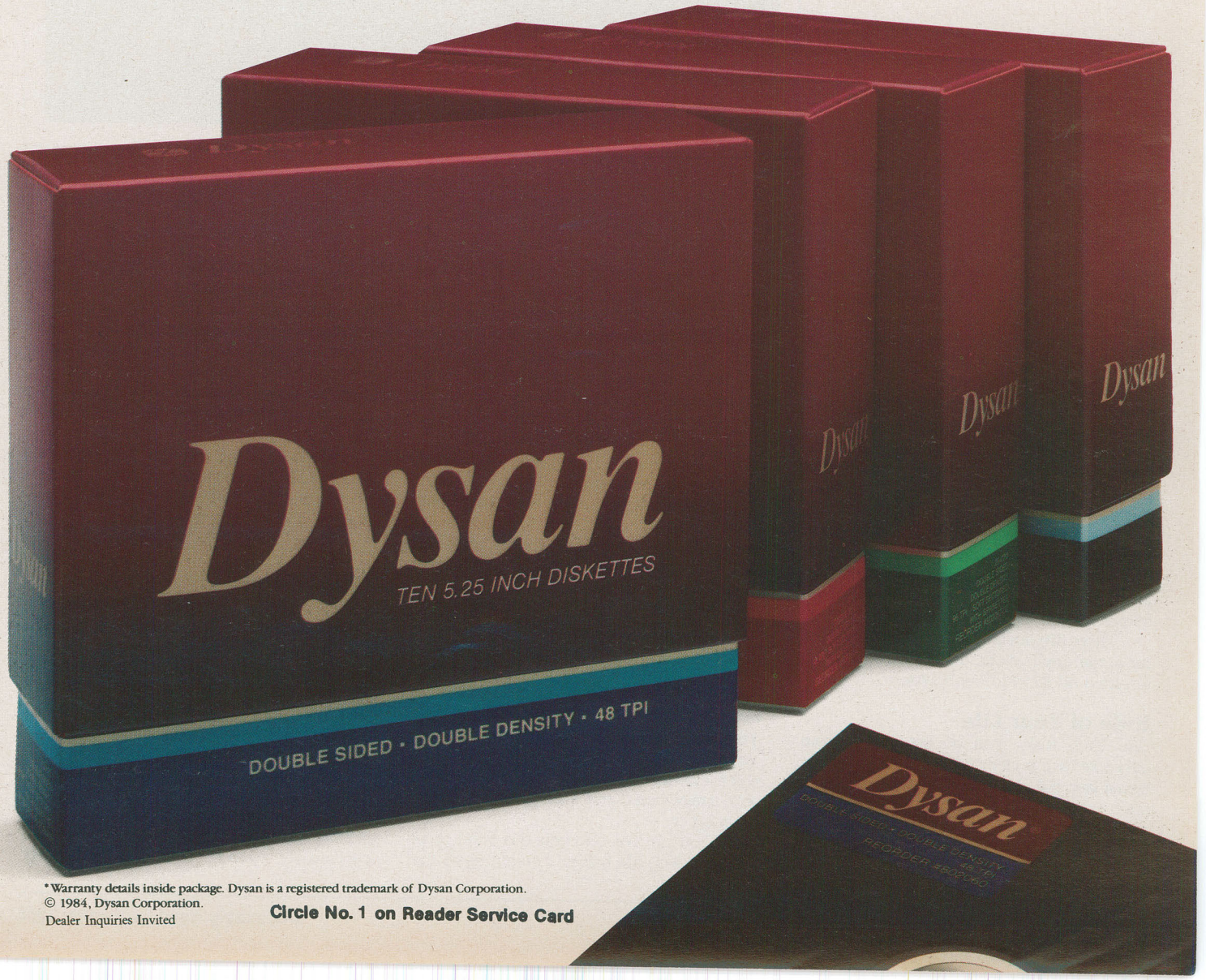

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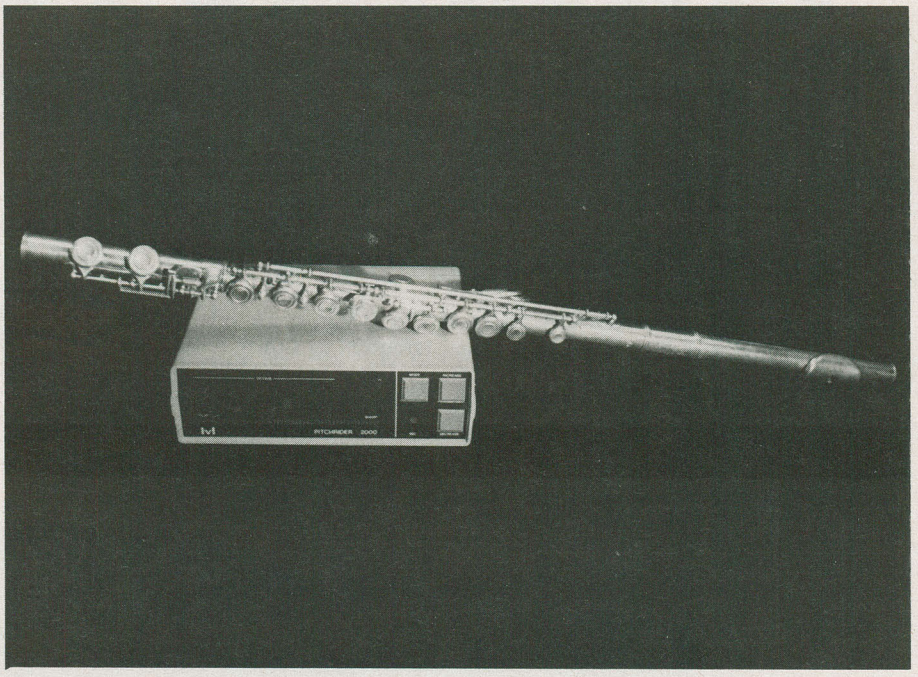
Circle No. 1 on Reader Service Card

Pitch Rider Review

Computer music doesn't necessarily have to be played through keyboards. Let us check out a box which can create MIDI data from actual acoustic sound.

by Steve Rimmer



The Pitch Rider is interesting in that it appears to have been initially designed for something quite different from the function that makes it so powerful. In its simplest incarnation it will take a note sung or played into it and tell you what note it would be on a standard piano keyboard and how many cents sharp or flat it is.

This is an interesting enough little gadget, to be sure, although it has limited usefulness as it goes. However, somewhere in its evolution the designers of the Pitch Rider saw fit to heave a MIDI output jack in there... which totally changes its aspect and meaning in the cosmos. Within reason, this latest manifestation of the box turns it into a sort of analog to MIDI converter.

There are limitations to it, of course, but for some applications the Pitch Rider is an amazing addition to one's system.

Ride of Your Life

The Pitch Rider can accept sound from either its own built in microphone or an external jack out at the rear. The internal mike isn't really all that directional or responsive... sound from other sources is preferable.

The sound one feeds into a Pitch Rider is extremely critical. It's enamoured of sine waves. All of the advertisements for the Pitch Rider show someone playing a flute into it... with good reason. Flutes are among the few instruments which the Pitch Rider can digitize with reasonable accuracy. You can train your voice to run the Pitch Rider pretty well, but it takes an hour or so.

Guitars, for the most part... even when you play one monophonically... really don't cut it. There is supposed to be a polyphonic Pitch Rider in the work for axes. Other instruments, like saxaphones, horns, viols and pianos confuse the Pitch Rider almost hopelessly.

The ideal trip, then, is a flute with a Barcus Berry pickup. Barring this one can use a flute with a good microphone in a very quiet room. You have to turn off the computers, disconnect the phones and remove everything that even breathes from around your mike... with the possible exception of yourself... lest the Pitch Rider latch onto some extraneous sounds and fill your rests with grace notes and arpeggios you hadn't counted on.

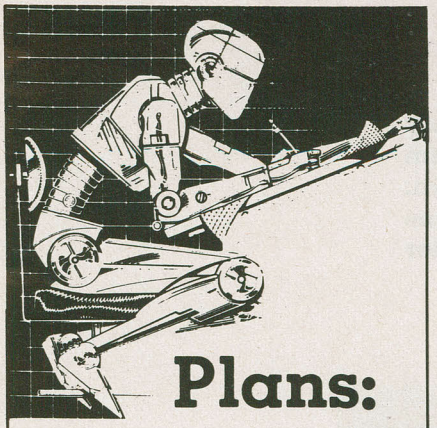
Allowing that one gets the Pitch Rider properly fed with noises... it's not really that hard... and properly set up the rest largely involves playing. Blast a note into the little swamp troll and its LED display will come up with the appropriate letter. Other LEDs light up for the octave and to tell you whether the note is a *bona fide* sharp or flat. Beyond this, there is a long bar graph thing at the bottom to show you how far off the absolute pitch the note is.

While it's doing this, the Pitch Rider will also send MIDI data out to whatever it's connected to. It generates note on, note off, frequency and volume information.

Chameleons

If you hook the Pitch Rider to a MIDI synthesizer... such as the ubiquitous Yamaha DX-7... and play into it, the synthesizer will play along with you. Run the synthesizer through headphones... get some of the big padded ones so you can't hear the flute... and you'll be able to play on the flute any instrument the synthesizer can manage.

Now, this gets a bit strange. Patched into the DX-7, I was happily tooling away on the flute but it sounded just like a harpsichord, or a cello, or vibes... the vibes were particularly good, sounding extremely



Plans:

System:	**Pitch Rider**
Compatible:	**Any MIDI system, any decent flute.**
Manufacturer:	**IVL Limited, #19 - 3318 Oak Street, Victoria B.C. V8X 1R2, (604) 383-4320**
Distributor:	**XL Electronics, Computer Music Centre, 317 College Street, Toronto, Ontario M5T 1S2, (416) 921-8941**
Price:	**$595.00**

Circle No. 59 on Reader Service Card.

Frank Zappa even if I was playing Pachelbel.

The ability of the Pitch Rider to track the flute is almost godlike. The literature says that it'll know the frequency within ten milliseconds plus one and a half cycles of the note you play. This amounts to a bit more than twelve milliseconds at A above middle C. In actual playing terms, it reacts pretty well instantaneously. Even if you play like Ian Anderson before old age set in on him you won't manage to fox the Pitch Rider.

Playing it into a PC running Personal Composer is a hoot, as it will write scores as you play... something to watch.

The thing that really did it for me in using the Pitch Rider was in the difference between what things sound like when they're phrased on a keyboard and then on a flute... regardless of the voice that's being used. The notes are the same but the way one plays them is different, and really pedestrian sounding things took on a lot of new life.

A Ticket to Ride

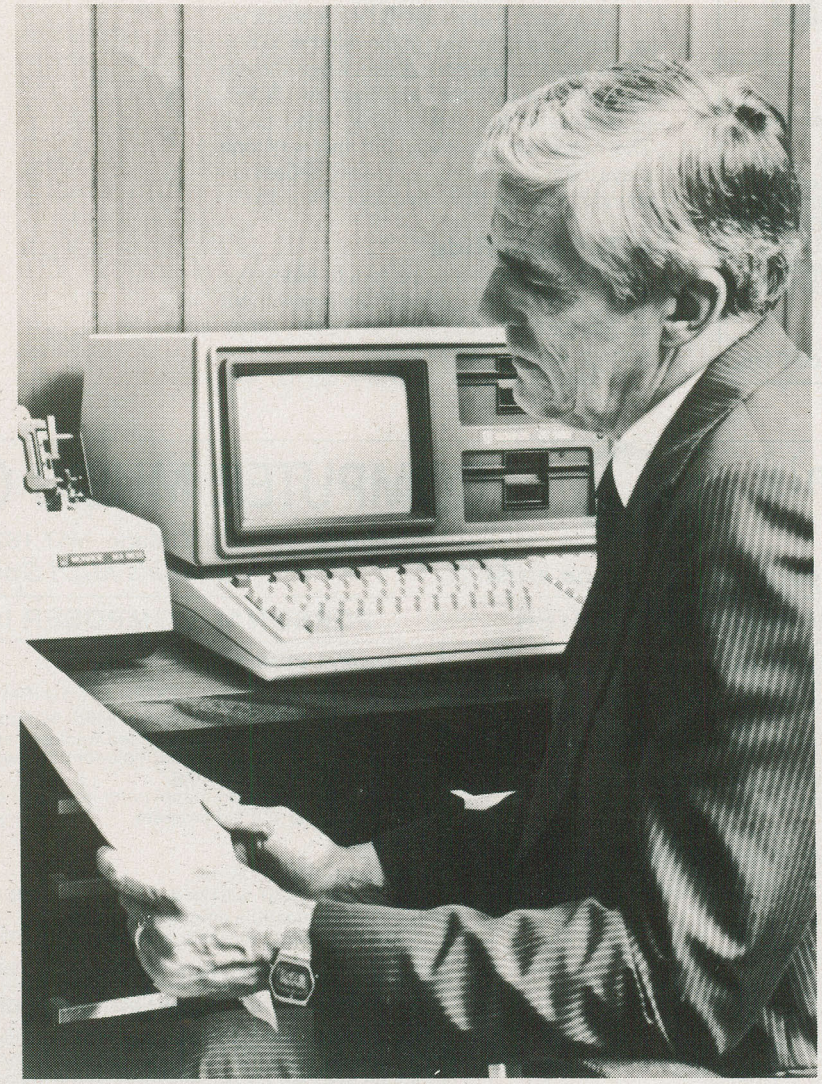
The Pitch Rider is a good tool to tune your flute... or your voice... with. As a new input source for a MIDI system, however, it's inspiring. It's also fairly cheap.

There are a lot of really off the wall things one can concoct as potential applications for a device of this sort. The popular cat harp, for example... twenty-four cats which have been trained to howl in an equally tempered scale when rapped on the head... might well become a MIDI controller. The other end of this... cats that can be played by another MIDI instrument... is a bit trickier. **CN!**

Secret Trolls for CP/M

While it isn't all shiny and state of the art any more, CP/M is a very viable operating system and, more to the point, a blast to hack in. Here's a cornucopia of tricks and techniques for assembly language programming under CP/M amassed through eons of travels.

by Steve Rimmer



In writing machine language programs to run under CP/M there are quite a number of short cuts one can take which make the development of code a lot easier and, if you're really sharp, the resulting code a lot faster. Some are pretty simple and obvious... especially after you know them. A few are down right devious.

In developing Z80 code... especially in doing projects which entail developing large waving fields of code... these sorts of tricks can save a lot of time and hassle. A number of them aren't even programming things, but, rather, innovative ways to use the tools one has to play with.

There are a number of CP/M based assemblers available, but, for the most part anything you want to do can be done with ASM. You can use MAC... its command line switches are quite a bit simpler to comprehend and macros are a powerful facility... but we'll avoid gilding the lily even a bit for this feature. Everything here is to be ASMable.

Trade of the Tricks

The basic function of the assembler is to take mnemonic source code and make a hex file out of it. This involves doing two things, in essence... it has to translate the codes and their operands... and the pseudo ops... into bytes, and it has to keep track of the addresses to which the bytes go.

Let's start with a few simple ways to confuse the assembler.

Relocatable code is very useful. If you had an assembler which supported Z80, rather than 8080 codes, and your computer used a Z80, you could use the relative jumps of the Z80 to write true relocatable programs, that is, ones which could be placed anywhere in memory and work.

This is not the case, however. More to the point, it wouldn't be all that useful a facility even if you had it. Unlike as in the case of, say, an Apple running DOS, there aren't all that many places a program under CP/M is likely to go. Normally they all run at 0100H.

There are times when one wants to put little programs in high memory. The most useful application of this is in creating loadable operating system patches. The deal here is that you write a program which, when run, will change the CP/M in memory to do something it ordinarily wouldn't.

A program like this will still load at 0100H but the active part of it must move up to its high memory destination before it is executed. This function is fairly easy. The hard bit is in making the code think it should run up there when it's assembled.

Obviously if you write the relocated code so that it is just part of the file that loads and runs at 0100H and then move it up to high memory, all of the absolute jumps and calls will point back down to low memory and the thing will fry the first time it encounters one.

The trick to this is to write a program with pseudo-labels; pseudo-labels are labels which have a value when they're assembled which is different from their actual value. Here's an example of their use. This program would be moved into high memory at 0E000H... assuming that there was a blank space and actual memory here. It would be patched into the BIOS such that all the console characters would go through it on their way to the screen. It translates them to upper case.

```
SOURCE EQU    $
DEST   EQU    0E000H      ;WHERE THE CODE GOES
OFFSET EQU    DEST-SOURCE ;LABEL OFFSET
       TRANS  EQU    $ + OFFSET
       MOV    A,C        ;COPY CHARACTER INTO A
       CPI    'a'        ;IF IT'S LESS THAN a
       JL     NOTRAN     ;DON'T TRANSLATE IT
       CPI    'z'        ;IF IT'S MORE THAN z
       JG     NOTRAN     ;DON'T TRANSLATE IT
       SBI    'a'-'A'    ;OK THEN... TRANSLATE IT
       NOTRAN EQU    $ + OFFSET
       MOV    C,A        ;PUT CHARACTER BACK IN C
       JMP    CONIN      ;PUT REAL CONIN VECTOR
                         HERE
```

The dollar signs are the thing here. They are a little used expression which equals the current value of the assembler's program location counter. This means that, for example, the value "$" at the start of a program would be 0100H.

If the difference between the start of the program, 0100H, and the start of the relocated code, 0E000H, is the value OFFSET then the expression $ + OFFSET serves as a moveable fake label. It's a bit cumbersome at first, but it works.

Exchange of Prisoners

The following program will most likely hang.

```
       MVI    C,9
       LXI    D,MESS
       CALL   BDOS
MESS   DB     There once was a hermit named Dave$'
```

This is a mistake everyone makes sooner or later. Having executed the BDOS call and returned from it, the processor will proceed to execute the string at MESS thinking it is a sequence of instructions. The results should be unpredictable at best.

The fact that the processor doesn't know the difference between bytes generated by mnemonics and those placed there in DB pseudo ops can be useful. For example, there are many cases in which one wants to save all the registers onto the stack, execute some routine and then restore them. This requires eight instructions and, more to the point, eight fairly slow instructions.

If your computer uses a Z80 rather than an 8080... most of them do now... and if this facility isn't already being used in some sort of tricky interrupt handler... you might be able to save a lot of processor overhead on things like this by using the Z80's phantom registers. You probably didn't know about these guys. The Z80 not only has A, F, B, C, D, E, H and L... there is also a complete duplicate set of these things and a way of swapping them in and out.

If you had a Z80 assembler you would be able to use the instructions EX to exchange A and F with A' and F'... the primes are the phantom registers... and EXX to swap all the rest of the registers in one shot. As it is, however, you can still do it by using the bytes which these instructions assemble down to. The byte for EX is 08H and the byte for EXX is 0D9H. Thus, the line

```
DB      08H,0D9H
```

stuck in your code where all the PUSHes would go will swap all the registers. The next time it is encountered it will swap them all back again. However, there are some catches to this.

Unlike as in the case of saving the registers to the stack, you obviously can't nest these things. In some cases we will push things to the stack and still expect to have them to use in the code that's inside the push. You can't do this with a register swap. You could pass a value to the code inside the push... or the swap, in this case... by only using the EXX... 0D9H... instruction and leaving the A register unswapped.

Finally, as I mentioned before, some computers make use of the phantom registers for housekeeping. If your computer takes care of interrupts somewhere in its BIOS it may well do all its internal fiddling with the phantom registers. If things behave peculiarly when you play with these instructions you probably shouldn't be using 'em.

De Bugs

In playing with commercial programs... or CP/M itself... one very often wants to make small patches to existing code. Invariably these don't go at 0100H and, in the normal course of events one would have to install them by hand using the mini-assembler in DDT. This is tedious.

Here's a very simple patch. It changes the sign on string in the BIOS of my computer so it says something other than what was originally there. To use it I would create a SYSGEN image in which... through previous DDTing... I know to put the string at OD67H. I would lay this evil little change on it and SYSGEN it back onto the disk.

Legally speaking I can do this because I wrote this particular BIOS. I'm sure it's foul and vile and nasty to do it to a commercial BIOS but this is between you and your conscience. In any case, this is an example... there are much more practical things to do with this technique.

Here's the code...

```
ORG    0D67H
DB     26,'Mother Martha's BIOS',13,10
DB     'Copyright (c) 1903',13,10
DB     'Wombat Brothers
       Software',13,10
DB     '$'
END
```

This assumes, of course, that the string that's in there now is as least as long as this one. It is in my case... I was extremely verbose.

Now, to check out the numbers... the ORG tells the assembler that this code starts at 0D67H... usually code starts at 0100H. You may well ask why this matters, as there are no jumps or calls or, in fact, any absolute addresses in this thing. This is mostly true... there are, however, implicit addresses.

When we assemble this we'll get a .HEX file. Normally one would use LOAD to make this into a .COM file... which we won't do this time. The .HEX file contains hex numbers for all the bytes, checksums and, most important, absolute addresses where this code... such as it is... is supposed to go.

Now, with the SYSGEN image, the code we want to patch, in memory, we would get into DDT.

```
-IMARTHA.HEX
-R
-G0
```

The I command sets the name after it as a file control block. The R command reads in the file set up by the last I. However, the tricky bit is that DDT treats files with the extension .HEX differently than it does all other files, which it would normally just load into memory. It interprets .HEX files, decoding their addresses and putting them where they say they are supposed to go. As such, it will put our little patch up at 0D67H, right where we want it.

This trick isn't limited to installing strings in code... although it is a lot easier than putting them there a byte at a time. It also works with little patches. Just ORG them out at wherever they're supposed to go and load them in with DDT.

Another handy trick with DDT is knowing how to get into it from a program. In debugging a complex program under DDT you may want to be able to enter the debugger programmatically. You can do this by putting the almost unheard of instruction

```
RST     7
```

in your code at the point where you want to pop into DDT. This leaps to a hook which DDT installs in CP/M when it boots and drops you back to the dash prompt. Remember to take the RST 7 out of your code when you're finished with it... a jump to this hook when DDT isn't installed can be unpredictable.

Other Short Bytes

Occasionally you'll want to re-execute a program which is still in memory. There are a number of uses for this facility. If you're using an editor which takes a long time to get into and you accidentally exit it you'll probably rather get back to where you were as opposed to starting the whole ordeal over again. This is especially true if there is data in your program which you don't want to lose.

If you'd had the forethought to have installed ZCPR2 you would be able to use the GO command... I know, no one has that much forethought. There is, however, an easier way which works under some circumstances. You'll need a null program.

A null program is a .COM file which is no bytes long. You can make one by doing

```
A►SAVE 0 RESTART.COM
```

When you thereupon type RESTART the program will load into memory and the processor will run it, jumping to 0100H. Because the program has no bytes, however, there will be none of it to run when it gets there. The processor will run whatever used to be in memory before you ran RESTART, thinking that this is what got loaded. This would be your previous program, which will get going again.

There are a number of reasons why RESTART may not work. Many programs are not restartable... they alter themselves in some way upon being run the first time and cannot be accessed through the front door a second time.

After the Crash

A lot of the more slothful programmers use WordStar in the N mode to edit program files... I do this too. I can't get around to learning another editor even if there are better ones for the task. If you do this you'll have probably lost a few files to BDOS errors in your time.

In general, the big programs aren't a problem when this happens because big programs are built up bit by bit and most of the time one gets into a large file just to change a few bytes. You can always change 'em again. It's the little patches and files that you type in all in one shot that are so painful when they snuff it prematurely.

You can save BDOSed WordStar file in a lot of cases... assuming you have DDT on the disk.

Get into DDT. Yes, it will overwrite WordStar but this doesn't matter. DDT is much smaller than WordStar so it will only overwrite some of its code... it won't trash the text buffer.

The first thing you have to do is to locate the start of the text buffer. This varies amongst different versions of WordStar... start looking around 7800H. When you find your text go through it until you find the end. Let's say that it's up at 0A00H for this example.

Lay the following command on DDT

```
M7800,0A00,0100
```

This will move your text down so that it starts at 0100H. Get out of DDT with a control C and save the file. You'll have to know the number of sectors worth of text you have... I usually just get lazy and specify a large number of sectors and edit the flotsam away afterwards.

Reboot

There are a lot of tricks that make CP/M assembly language programing easier... most of them tend to be a bit specific. You'll no doubt develop a number of your own. Much of doing so involves simply understanding what all the tools really do, and using their facilities.

Far from being the dead language that a lot of heads regard it as, CP/M is a powerful little beast for quite a number of uses. It's still worlds more fun to hack than is MS-DOS, and there's a powerful user base set up for it. CP/M based machines are a lot cheaper than are the newer sixteen bit machines and, unless you have some particular need for a half a megabyte of RAM you'll probably find them adequate.

And there are no fiendish memory segments to worry about... a splendid trip to be sure. **CN!**

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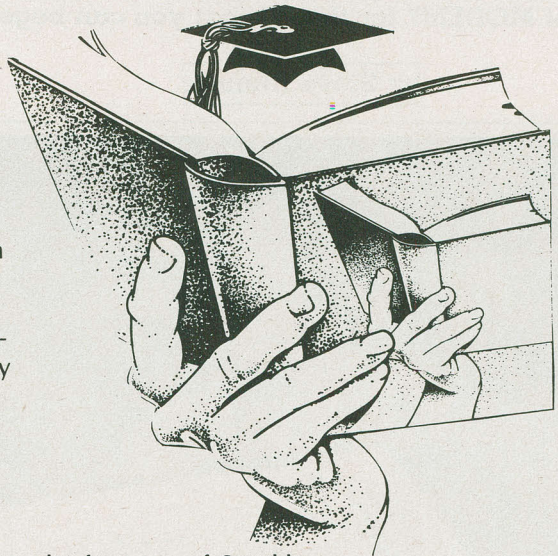

If you're involved with managing stock, handling inventories or just counting the tins of beans you have on your shelves you're probably already aware of how much a computer could help. However, commercial inventory control packages are expensive and inflexible. They usually only run on very large, costly computers. You'll need a three year course in astrophysics to learn how to use one.

Stockboy is the inventory control package for people who want to run their businesses... not their computers. It can be mastered in a quarter of an hour by a gorilla or, if you're fortunate enough to be a human being, in rather less time. It explains everything in simple English and delivers clear, easily understood reports when ever you need them.

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UltraBoot for the IBM PC

The MODEM7 question was one of the early philosophical paradoxes of the universe. You see, you need MODEM7 to get MODEM7 but if you have MODEM7 you really have no need to get it in the first place. There's a good reducto argument in there to disprove the existence of MODEM7 and, if you stretch it a bit, everything else too. Here is a simple implementation of MODEM7 for the PC that you can beget from scratch.

by Steve Rimmer

You find a lot of weird things on bulletin boards. I'm sure that the heads who run those things don't check out half the stuff they put on their disks. The best one in recent memory was a library of software and demonstration files for a voice synthesizer. You have to think about this for a moment. Rather than speak over the telephone somebody took about four thousand dollars worth of hardware and found a way to digitize voices so they could be sent over the phone using a modem at about a thousandth of the speed of simple talking.

There is some really weird karma in high technology.

Public domain telecommunications software is another one of those areas which is fraught with peculiar irony and several other literary devices. There is some really superb software out there, complete with all sorts of downloading facilities and the like. However, in order to get a downloading package down from a bulletin board you'll need to have a downloading package already on your disk. If you have a downloading package you probably won't need a downloading package and, as such, the very existential premise for telecommunications software in general becomes a bit shaky.

There are a number of ways around this, of course. The easiest... although by far the most slothful... is to simply buy a telecommunications package or have someone put one of the public domain ones on a disk for you. Check out our almost free software for this... we're really into sloth. There are, however, far more adventurous approaches to this situation.

Back in the hard cruel days before the existence of almost free software and most other civilized things there was another way to get a version of MODEM7... the only really meaningful telecommunications package... down to one's personal computer. It involved the use of a program called MBOOT3. This little freak was a downloading program which was small enough to be typed in by hand within the lifetime of a single human being. While a bit bereft of slick features, it was just barely capable of getting something better from a remote bulletin board system.

The MBOOT program was, of course, a denizen of CP/M. As far as I know there's nothing similar for MS-DOS... which is a drag, as the terminal packages for the PC are even bigger, nastier and less obtainable than the CP/M stuff was.

This month we are going to take a look at UltraBoot, the IBM equivalent to MBOOT, a simple implementation of a receive-only version of MODEM7.

Blocks and Headers

In order to understand how the code that accompanies this article works you really have to know how the MODEM7 file transfer protocol is designed to do its thing. It's a bit weird, and uses a lot of funny characters, but you can get your head around it if you ignore its assorted permutations and brain mice.

If you send raw data from one computer to another one over the phone it goes as a steady stream of bytes. This is cool... until someone at Bell spills coffee on the switcher and the thing clicks a few times. A couple of bytes will invariably get trashed and, if your file was some sort of program you will probably have a really sophisticated parity error generator in its place. More to the point, you may not even know your file has been gorched.

Under MODEM7, files are sent over the wire by breaking them down into blocks of a hundred and twenty-eight bytes.

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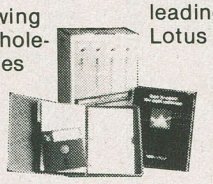

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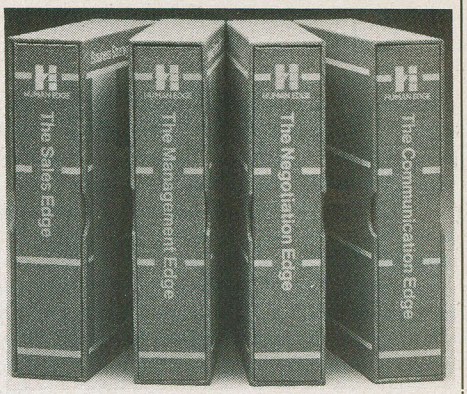

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Circle No. 5 on Reader Service Card

Because this is the length of a logical disk sector these things are often referred to as *sectors*. Each block is sent and, having been sent, both ends of the conversation compare notes to make sure that the block came across uncorrupted.

With the blocks properly reassembled into a file one can be pretty sure that what got sent actually wound up on the receiving system's disk.

The process of sending blocks of data is a bit involved. The computers have to agree when a block starts, when it is complete, what it contains and where in the original file it came from. This agreement is, essentially, what the MODEM7 protocol consists of.

Each block that's sent is actually a hundred and thirty–two bytes long, the extra bytes being data the protocol needs. These extra bytes get trashed before the sector is added to the receiving computer's file, of course, so the sectors that go into the file are the right length. A typical sector would be

SOH Block Anti-block Data...Data Checksum

Unless you are a transistor for part of the time this probably won't make any sense just yet. Sweat not... we'll get into what all these cryptic abbreviations mean.

The first byte of a sector is a *start of header* character, which is actually a control A. This is very useful, because it allows the receiving computer to know that it has the start of a block... well, it can be pretty sure. It tells the sending computer to send a sector... we'll get to that... and waits for a character. If the first one it gets is a control A it's laughing. Otherwise it will wait for a while... until the whole sector has been sent... and tell the sending computer that something went wrong. We'll get to that too.

The next two bytes are the block number and the twos compliment of the block number. This would be 01H and 0FEH respectively for the first sector. You can send more than two hundred and fifty–five sectors... the block numbers would just wrap around. The block numbers allow MODEM7 to make sure that a sector hasn't been sent twice and that it hasn't missed one all together. The block number of the current sector should be one greater than that of the last sector. If it isn't, it can tell the sending computer that something uncool has happened and have it resend the right sector.

Notice that the block number, the twos compliment and the start of header, when added together as a single byte, always add up to zero.

The next stuff in the sector is the data itself. There'll always be a hundred and twenty–eight bytes of it. It's followed by a single byte checksum. One calculates a sector checksum by adding up the start of header character, the two block numbers and all the data in one byte. This means that one only winds up with the least significant byte of the calculation, but the same sector checksumed at both ends of the transfer should yield the same byte.

By comparing the checksum it receives with the checksum it calculates the receiving computer can decide whether or not it has received the sector properly.

There are three more freaky codes to be concerned with here. The first is the character ACK, for acknowledge... more commonly come upon as control F. When the receiving terminal gets a sector that it feels in its heart is good it will send an ACK back to the sending terminal to say "Hey, ugly. I liked that one. Send me another."

If, on the other hand, the sector doesn't pass muster the receiving computer will send back a NAK, or control U. In this case the sending system will send the same sector over. The receiving computer will trash the first version of the sector and overwrite it with the new one... hopefully a better trip.

The NAK character is also used by the receiving computer at the beginning of a transfer to tell the sending computer to send the first SOH.

Finally, if the receiving terminal, while waiting for the SOH of its next sector, gets an end of transmission character, the fabled EOT or control D, it will party itself off line, proclaim the end of the file and, presumably, write the contents of its little mind to the disk.

This version of MODEM7 is a bit stripped down to make it practical to copy by hand. It does implement the protocol, however. Some compatible systems may barf on it if you try to use it at higher baud rates, as it doesn't really handle the serial interface well enough to take into account the rather lengthy period the PC takes to scroll its screen.

```
                COMMENT         /

                ULTRABOOT FOR THE IBM PC
                Copyright (c) 1985ad STEVE RIMMER

                MAY CONTAIN OP CODES THAT ARE
                HARMFUL TO YOUR CAT'S FACE

                                /

                CODEX   SEGMENT
                ASSUME  CS:CODEX,DS:CODEX,ES:CODEX

SOH             EQU     'A'-40H
EOT             EQU     'D'-40H
ACK             EQU     'F'-40H
BS              EQU     'H'-40H
LF              EQU     'J'-40H
CR              EQU     'M'-40H
NAK             EQU     'U'-40H
CAN             EQU     'X'-40H
EOF             EQU     'Z'-40H

MODCTLP         EQU     3FDH            ;MODEM CONTROL PORT
MODDATP         EQU     3F8H            ;MODEM DATA PORT
MODSNDB         EQU     20H             ;BIT TO TEST FOR SEND
MODSNDR         EQU     20H             ;VALUE WHEN READY
MODRCVB         EQU     01H             ;BIT TO TEST FOR RECEIVE
MODRCVR         EQU     01H             ;VALUE WHEN READY
FCB             EQU     005CH

MAIN            PROC    FAR
                ORG     0100H

START:          JMP     MAIN_CODE       ;HOP OVER FIXED STUFF
MSPEED:         DW      0000            ;BAUD RATE
TWO:            DW      0002            ;CONSTANT TWO
ERROR_COUNT:    DW      0000            ;ERROR COUNTER
TIMEOUT_COUNT:  DW      0000            ;TIMEOUT COUNTER
BLOCK_NUMBER:   DW      0000            ;BLOCK NUMBER
START_COUNT:    DW      0000            ;START ATTEMPTS COUNTER
LAST_BLOCK:     DW      0000            ;LAST BLOCK NUMBER
POINTER:        DW      0000            ;POINTER INTO STASH
RECORD_COUNT:   DW      0000            ;RECORD COUNTER
BYTE_COUNT:     DW      0000            ;INDEX INTO SECTOR BUFFER
SECTOR:         DB      132 DUP(0)      ;SECTOR BUFFER

MAIN_CODE:      CALL    ILPRT
                DB      CR,LF,'|   Modem7 download program   |'
                DB      CR,LF,'| The IBM PC and other trolls |'
                DB      CR,LF,'| None too slick but it works |'
                DB      CR,LF,'| Copyright (c)  Steve Rimmer |'
                DB      CR,LF,'|        Not for use by       |'
                DB      CR,LF,'|   veggies who really like   |'
                DB      CR,LF,'|         Toyota trucks       |',0
                CALL    OPEN_FILE               ;OPEN FILE
                CMP     AL,0
                JE      GOOD_OPEN               ;CHECK FOR GOOD OPEN

                CALL    ILPRT
                DB      CR,LF,'|   Gotta have a file name.   |',0
                JMP     EXIT

GOOD_OPEN:      CALL    PUT_BAUD                ;SET BAUD RATE
                CALL    DUMB_TERM
                CALL    RECEIVE                 ;DO DOWNLOAD

EXIT:           CALL    ILPRT
                DB      CR,LF,'|    Slinking away to DOS     |',0
                INT     20H             ;BACK TO DOS

MAIN            ENDP

OTHER_STUFF     PROC    NEAR                    ;SLEAZY, BUT IT SAVES SPACE

RECEIVE:        MOV     [BLOCK_NUMBER],1        ;START BLOCK COUNT
                MOV     [START_COUNT],0         ;ZERO START COUNT
                MOV     [RECORD_COUNT],0        ;ZERO RECORD COUNTER
                MOV     [LAST_BLOCK],0FE01H     ;DUMMY LAST BLOCK NUMBER
                MOV     AX,OFFSET STASH         ;SET POINTER
                MOV     [POINTER],AX            ;TO STASH
                CALL    ILPRT
                DB      CR,LF,'|     XMODEM receive mode     |',0

REC_START:      CALL    SERIAL_FLUSH            ;EMPTY SERIAL BUFFER
                CALL    ILPRT
                DB      CR,LF,'Sending start',0
                CALL    SEND_NAK                ;SEND INITIAL NAK

GETCH_SOH:      CALL    GETCH_SERIAL            ;GET A BYTE
                CMP     AH,0
                JE      TEST_SOH                ;GOOD DATA, CHECK IT
                CMP     AH,1                    ;IF TIMEOUT,
                JNE     BAD_START               ;SEND ANOTHER NAK

                CALL    ILPRT
                DB      CR,LF,'Timeout on start ',0
                INC     [START_COUNT]           ;BUMP COUNTER
                CMP     [START_COUNT],10        ;IF TOO MANY TRIES
                JG      BAD_START               ;BE GONE
                JMP     REC_START               ;ELSE, TRY AGAIN

BAD_START:      JMP     REC_LOST                ;LONG JUMP TO GIVE UP

TEST_SOH:       CMP     AL,SOH                  ;IS IT START OF SECTOR?
                JNE     TEST_EOT
                JMP     GOT_SOH

TEST_EOT:       CMP     AL,EOT                  ;IS IT END OF TRANSMISSION?
```

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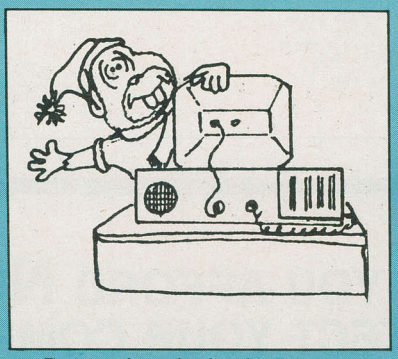

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```
                JNE     TEST_CAN
                JMP     GOT_EOT

TEST_CAN:       CMP     AL,CAN                  ;IS IT REMOTE ABORT?
                JNE     BAD_BYTE
                JMP     GOT_CAN

BAD_BYTE:       MOV     AH,0                    ;SOMETHING UNPLEASANT
                PUSH    AX
                CALL    ILPRT
                DB      CR,LF,'Curses... I got a ',0
                POP     AX
                CALL    DECIMAL                 ;SHOW THE BAD CHARACTER
                INC     [START_COUNT]           ;BUMP START
                CMP     [START_COUNT],10        ;SEE IF IT'S TOO MANY STARTS
                JG      NO_START                ;IF SO, BE GONE

                MOV     CX,80                   ;ELSE
                CALL    WAIT                    ;WAIT SEVERAL SECONDS

                JMP     REC_START               ;AND TRY AGAIN

NO_START:       CALL    ILPRT
                DB      CR,LF,'Lots of bad starts. To hell with it.',0
                JMP     REC_LOST                ;AND BE GONE

GOT_EOT:        CALL    SEND_ACK                ;IF END IF TRANSMISSION
                CALL    ILPRT
                DB      CR,LF,'The file is in the can - all cool',0
                JMP     REC_EXIT                ;AND BE GONE

GOT_CAN:        CALL    SEND_CAN                ;REMOTE ABORT
                CALL    ILPRT
                DB      CR,LF,'Remote cancel. To hell with it.',0
                JMP     REC_LOST                ;GET LOST

GOT_SOH:        MOV     [START_COUNT],0         ;ZERO START COUNT
                MOV     BX,OFFSET SECTOR
                MOV     [BX],AL                 ;PUT SOH IN BUFFER

                CALL    ILPRT
                DB      CR,LF,'Awaiting block ',0
                MOV     AX,[BLOCK_NUMBER]
                CALL    DECIMAL                 ;SHOW BLOCK NUMBER

                MOV     BX,OFFSET SECTOR+1      ;POINT INTO SECTOR PAST SOH

                MOV     [TIMEOUT_COUNT],0       ;ZERO TIMEOUT
                MOV     [BYTE_COUNT],0          ;ZERO SECTOR INDEX

REC_LOOP:       CALL    GETCH_SERIAL            ;GET A BYTE
                CMP     AH,0                    ;CHECK FOR GOOD DATA
                JE      STASH_BYTE              ;IF SO, SAVE IT
                CMP     AH,1                    ;SEE IF IT'S A TIMEOUT
                JE      REC_TIME                ;IF SO, DO MESSAGE

                CALL    SEND_CAN                ;MUST BE AN ABORT
                CALL    ILPRT
                DB      CR,LF,'You hit control X. Goodbye.',0
                JMP     REC_LOST                ;BE GONE

STASH_BYTE:     MOV     [BX],AL                 ;SAVE BYTE
                INC     BX                      ;BUMP POINTER
                INC     [BYTE_COUNT]            ;BUMP INDEX
                CMP     [BYTE_COUNT],131        ;COMPLETE SECTOR?
                JE      GOT_SECTOR              ;IF SO, WE'RE COOL
                JMP     REC_LOOP                ;OTHERWISE, GET MORE BYTES

GOT_SECTOR:     CALL    CHECKSUM                ;CALCULATE THE CHECKSUM
                JNE     BAD_CHECKSUM            ;IF BAD, DO IT AGAIN
                CALL    CHECK_NUMBER            ;CHECK BLOCK NUMBER
                JE      GOOD_SECTOR             ;IF GOOD, SECTOR IS OK
                JMP     BAD_NUMBER              ;OTHERWISE, BAD BLOCK

GOOD_SECTOR:    INC     [BLOCK_NUMBER]          ;BUMP DISPLAYED BLOCK NUMBER
                MOV     [ERROR_COUNT],0         ;ZERO ERROR COUNT

                MOV     AX,[LAST_BLOCK]         ;BUMP LAST BLOCK NUMBER
                INC     AL
                DEC     AH
                MOV     [LAST_BLOCK],AX         ;UPDATE BLOCK NUMBER

                CALL    MOVE_SECTOR             ;PUT SECTOR IN STASH
                CMP     AL,0
                JNE     REC_OVER                ;TRAP DISK WRITE ERROR
                CALL    SEND_ACK                ;ACK THE SECTOR
                JMP     GETCH_SOH               ;GET ANOTHER SECTOR

REC_TIME:       INC     [TIMEOUT_COUNT]
                CALL    ILPRT
                DB      CR,LF,'Ack... timeout',0

                CMP     [TIMEOUT_COUNT],10      ;SEE IF TOO MANY TIMEOUTS
                JG      REC_OVER                ;
                JMP     REC_LOOP                ;OTHERWISE, TRY AGAIN

REC_OVER:       JMP     REC_LOST                ;LONG JUMP TO EXIT

BAD_CHECKSUM:
                CALL    ILPRT
                DB      CR,LF,'Ack... checksum error',0
                INC     [ERROR_COUNT]
                CMP     [ERROR_COUNT],10
                JL      REGET_SECTOR

REAL_BAD:       CALL    ILPRT
                DB      CR,LF,'Too many errors. To hell with it.',0
                JMP     REC_LOST

BAD_NUMBER:     CALL    ILPRT

                DB      CR,LF,'Ack... bad block number',0
                INC     [ERROR_COUNT]
                CMP     [ERROR_COUNT],10
                JL      REGET_SECTOR
                JMP     REAL_BAD

REGET_SECTOR:   CALL    SEND_NAK
                JMP     GETCH_SOH
```

```
REC_LOST:       CALL    ILPRT
                DB      CR,LF,'Aborting - snuffing the file.',0

                CALL    DELETE_FILE
                CALL    SEND_CAN
                JMP     NO_CLOSE

REC_EXIT:       CALL    CLOSE_FILE
NO_CLOSE:       RET

OPEN_FILE:      CALL    DELETE_FILE     ;KILL EXISTING FILE

                MOV     DX,OFFSET FCB
                MOV     AH,16H
                INT     21H             ;BREATH LIFE INTO A NEW FILE

                CMP     AL,0
                JE      OPEN_DONE       ;HMMM... WAS IT COOL?

                CALL    ILPRT
                DB      CR,LF,'Ack... the file will not open.',0
                MOV     AX,-1           ;SET THE FLAG

OPEN_DONE:      RET

DELETE_FILE:    MOV     DX,FCB
                MOV     AH,13H
                INT     21H             ;ONE BDOS CALL... NO WAITING
                RET

WRITE_FILE:     MOV     DX,OFFSET STASH         ;POINT INTO SECTOR STASH
                MOV     CX,[RECORD_COUNT]
WRITE_LOOP:     PUSH    CX                      ;SAVE COUNT
                PUSH    DX                      ;SAVE POINTER

                MOV     AH,1AH
                INT     21H                     ;SET DMA TO NEXT SECTOR
                MOV     DX,FCB
                MOV     AH,15H
                INT     21H                     ;WRITE THE SECTOR

                POP     DX                      ;RESTORE POINTER
                POP     CX                      ;RESTORE COUNT
                CMP     AL,0
                JNZ     WRITE_ERROR             ;SEE IF THERE'S A WRITE ERROR
                ADD     DX,128                  ;BUMP POINTER
                LOOP    WRITE_LOOP              ;AND GO AGAIN
                JMP     DONE_WRITE

WRITE_ERROR:    CALL    ILPRT
                DB      CR,LF,'Ack... disk write error',0
                MOV     AL,0FFH

DONE_WRITE:     MOV     BX,OFFSET STASH
                MOV     [POINTER],BX            ;RESET POINTER
                RET

CLOSE_FILE:     CALL    WRITE_FILE              ;SAVE ANY REMAINING SECTORS
                MOV     DX,FCB
                MOV     AH,10H
                INT     21H                     ;CLOSE THE FILE
                RET

MOVE_SECTOR:    ADD     [RECORD_COUNT],1        ;BUMP RECORD COUNT
                MOV     CX,128                  ;SET COUNTER FOR ONE SECTOR

                CLD                             ;SET MOVE DIRECTION
                LEA     SI,SECTOR+3             ;POINT PAST SOH AND BLOCK
                MOV     DI,[POINTER]            ;GET NEXT SLAB OF RAM
REP             MOVSB                           ;AND LET'S BOOGIE, CHILLUN

                SUB     AX,AX                   ;ZERO AX
                CMP     [RECORD_COUNT],32       ;BE IT TIME FOR A DISK WRITE?
                JNE     NO_WRITE                ;MAYBE NOT
                CALL    WRITE_FILE              ;OR, MAYBE YES. DO THE WRITE
                MOV     [RECORD_COUNT],0        ;RESET THE RECORD COUNT
                JMP     NO_BUMP                 ;AND DON'T BUMP THE INDEX
NO_WRITE:       ADD     [POINTER],128           ;BUMP THE INDEX
NO_BUMP:        RET

CHECK_NUMBER:   MOV     AX,[LAST_BLOCK]         ;CHECK OUT BLOCK NUMER
                MOV     DX,[SECTOR+1]           ;GET THE OLD NUMBER
                CMP     AX,DX                   ;SEE IF THEY MATCH
                RET

CHECKSUM:       SUB     AX,AX
                MOV     BX,OFFSET SECTOR
                MOV     CX,131
CHECKSUM_LOOP:  ADD     AL,[BX]
                INC     BX
                LOOP    CHECKSUM_LOOP
                CMP     AL,[BX]
                RET

WAIT:           PUSH    CX                      ;WAIT FOR CX * .1 SECONDS
                MOV     CX,28010                ;A TRENDY CONSTANT
WAIT_INNER:     LOOP    WAIT_INNER
                POP     CX
                LOOP    WAIT
                RET

FLUSH:          CALL    CONSTAT                 ;TRASH KEYBOARD GARBAGE
                JZ      FLUSH_EXIT
                CALL    GETCH
                JMP     FLUSH
FLUSH_EXIT:     RET

SERIAL_FLUSH:   CALL    TEST_SERIAL             ;TRASH MODEM GARBAGE
                JNZ     EMPTY_SERIAL
                CALL    GET_SERIAL
                JMP     SERIAL_FLUSH
EMPTY_SERIAL:   RET

GETCH_SERIAL:   PUSH    BX                      ;WAIT FOR A BYTE FROM THE MODEM
                PUSH    CX
                PUSH    DX                      ;SAVE SOME REGISTERS
                SUB     AX,AX
                MOV     [TIMEOUT_COUNT],AX
GETCH_BYTE:     MOV     CX,20000                ;TRY FOR CHARACTER
GETCH_LOOP:     CALL    TEST_SERIAL             ;IS ONE HANGING AROUND?
```

```
                JNZ     GETCH_LOCAL             ;MAYBE NOT... CHECK FOR ABORT
                JMP     GOT_SERIAL              ;MAYBE YES... LET'S SCOOT
GETCH_LOCAL:    CALL    CONSTAT                 ;OR MAYBE A KEYBOARD CHARACTER
                JNZ     GOT_LOCAL               ;IF SO, CHECK FOR ABORT
                LOOP    GETCH_LOOP              ;NO LIFE... KEEP TRYING

                INC     [TIMEOUT_COUNT]
                CMP     [TIMEOUT_COUNT],10      ;SEE IF WE'VE TRIED ENOUGH
                JL      GETCH_BYTE

                MOV     AH,1                    ;SHOW A TIMEOUT ERROR
                JMP     GETCH_LOST              ;AND RETURN IN DISGRACE

GOT_LOCAL:      CALL    GETCH                   ;GET LOCAL CHARACTER
                CMP     AL,CAN                  ;IF IT'S NOT AN ABORT
                JNE     GETCH_LOOP              ;GO BACK TO TRYING FOR DATA

                MOV     AH,2                    ;SAY IT'S A LOCAL ABORT
                JMP     GETCH_LOST              ;AND RETURN WITH ALIBI

GOT_SERIAL:     CALL    GET_SERIAL              ;GET SERIAL DATA
                MOV     AH,0                    ;PROCLAIM GOOD DATA
GETCH_LOST:     POP     DX
                POP     CX
                POP     BX                      ;GET THE REGISTERS BACK
                RET

PUT_BAUD:       MOV     CX,0180H                ;BAUD DIVISOR
                                                ;0180H = 300 BAUD
                                                ;0060H = 1200 BAUD
                MOV     DX,MODDATP+3
                MOV     AL,80H
                OUT     DX,AL                   ;SET THE DLAB (THE WHAT?)
                MOV     DX,MODDATP
                MOV     AL,CL                   ;SET LOW ORDER DIV
                OUT     DX,AL

                MOV     DX,MODDATP+1
                MOV     AL,CH                   ;SET HIGH ORDER DIV
                OUT     DX,AL

                MOV     DX,MODDATP+3
                MOV     AL,07H                  ;SET CFW
                OUT     DX,AL

                RET

DUMB_TERM:      CALL    ILPRT                   ;SAY "I'm a terminal"
                DB      CR,LF,'Most holy terminal mode - ^E to exit',CR,LF,0
DUMB_REMOTE:    CALL    TEST_SERIAL             ;SEE IF THERE'S A REMOTE BYTE
                JNZ     DUMB_LOCAL              ;... WHAT? NO BYTE
                CALL    GET_SERIAL              ;OK... A BYTE. SNATCH IT
                CALL    PUTCH                   ;AND FLING IT AT THE TUBE
DUMB_LOCAL:     CALL    CONSTAT                 ;HOW ABOUT A LOCAL CHARACTER?
                JZ      DUMB_REMOTE             ;MAYBE NOT... GO TRY THE MODEM
                CALL    GETCH                   ;GET THE LOCAL CHARACTER
                CMP     AL,5                    ;TIME TO FLEE?
                JE      DUMB_EXIT
                CALL    PUT_SERIAL              ;EXTERNALIZE ITS PERCEPTION
                JMP     DUMB_REMOTE             ;AND LOOP
DUMB_EXIT:      RET
```

```
GET_SERIAL:     PUSH    DX                      ;GET A BYTE FROM THE MODEM
                MOV     DX,MODDATP
                IN      AL,DX
                POP     DX
                RET

PUT_SERIAL:     PUSH    DX                      ;SEND A BYTE TO THE MODEM
                MOV     DX,MODDATP
                OUT     DX,AL
                POP     DX
                RET

TEST_SERIAL:    PUSH    DX                      ;CHECK FOR LIFE AT THE MODEM
                MOV     DX,MODCTLP
                IN      AL,DX
                POP     DX
                AND     AL,MODRCVB
                CMP     AL,MODRCVR
                RET                             ;Z SET IF DATA IS READY

DECIMAL:        PUSH    AX                      ;PRINT AX IN DECIMAL
                PUSH    BX
                PUSH    CX
                PUSH    DX
                MOV     BX,OFFSET BUFF
                PUSH    DX
                PUSH    SI
                PUSH    AX
                MOV     CX,6
FILL:           MOV     BYTE PTR [BX],' '
                INC     BX
                LOOP    FILL
                MOV     SI,10
                OR      AX,AX
                JNS     CLR
                NEG     AX
CLR:            SUB     DX,DX
                DIV     SI
                ADD     DX,'0'
                DEC     BX
                MOV     [BX],DL
                INC     CX
                OR      AX,AX
                JNZ     CLR
                POP     AX
                OR      AX,AX
                JNS     NOMORE
                DEC     BX
                MOV     BYTE PTR [BX],'-'
                INC     CX
NOMORE:         POP     SI
                POP     DX

                MOV     AH,9
                MOV     DX,BX
                INT     21H

                POP     DX
                POP     CX
                POP     BX
                POP     AX
                RET
BUFF:           DB      '      $'

SEND_NAK:       MOV     AL,NAK
                CALL    PUT_SERIAL
                RET

SEND_ACK:       MOV     AL,ACK
                CALL    PUT_SERIAL
                RET

SEND_CAN:       MOV     AL,CAN
                CALL    PUT_SERIAL
                RET

CONSTAT:        PUSH    BX                      ;CHECK KEYBOARD STATUS
                PUSH    CX
                PUSH    DX
                MOV     AH,1
                INT     16H
                POP     DX
                POP     CX
                POP     BX
                RET

ILPRT:          POP     BX                      ;IN LINE PRINT
ILPLP:          MOV     AL,[BX]
                CMP     AL,0
                JE      ILPRET
                CALL    PUTCH
                INC     BX
                JMP     ILPLP
ILPRET:         INC     BX
                PUSH    BX
                RET

PUTCH:          PUSH    DX                      ;PRINT CHARACTER IN AL
                PUSH    CX
                PUSH    BX
                PUSH    AX
                MOV     AH,15
                INT     10H
                POP     AX
                PUSH    AX
                MOV     AH,14
                INT     10H
                POP     AX
                POP     BX
                POP     CX
                POP     DX
                RET

GETCH:          PUSH    BX                      ;GET A KEYBOARD CHARACTER
                PUSH    CX
                PUSH    DX
                MOV     AH,0
                INT     16H
                POP     DX
                POP     CX
                POP     BX
                RET

STASH:          DB      0                       ;START OF SECTOR BUFFER

OTHER_STUFF     ENDP
CODEX           ENDS

                END     START
```

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To find out if you qualify for the assistance program, contact the Manager of External Software Development, Waterloo Microsystems, 175 Columbia Street West, Waterloo, Ontario, N2L 5Z5, telephone (519) 884-3141.

Touch Tablet

The Keyport 300, a **touch-sensitive tablet** for the IBM PC, PC/XT, PC/AT, 3270, Compaq and compatibles, will be distributed in Canada exclusively by Datamex. Developed by *Polytel Computer Products* of Sunnyvale, California, the input pad simplifies the use of spreadsheet and word processing software by eliminating the need to memorize commands. The device requires only 128K bytes of RAM to operate with PC-DOS, and including cables and software, retails for just over three hundred dollars Canadian.

For more information, contact Datamex, 115 Norfinch Drive, Downsview, Ontario, telephone (416) 665-1808 or 1-800-387-3527 toll free.

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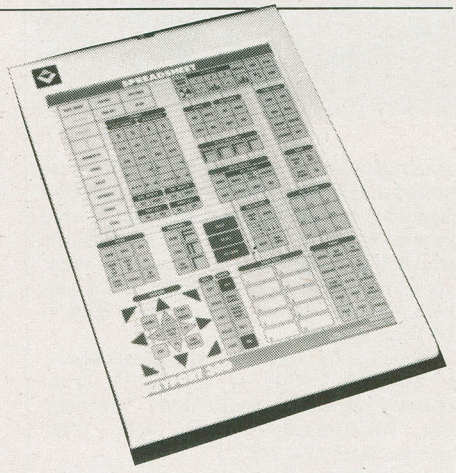

Sorry, John

The byline of John Rudzinski, Computing Now!'s departed assistant editor, was accidently zapped from the Computer Press in the August issue. It wasn't deliberate... we just had a hard time finding someone who could spell it.

And we have a winner...

We sent an expedition into the pile of entries which we received for the second Computing Now! giveaway... it's that large white area that's covering most of Ontario on the weather maps these days... and they returned with a correct answer, submitted by James Hall of Belleville, Ontario. He proved that one could not successfully draw a continuous line through all the segments of the box.

James is now the owner of an authentic Mitsubishi AM—1301C colour tube.

We thank everyone else who entered the contest... sorry we couldn't give you all monitors. However, there'll be plenty of opportunities to win other stuff in the months ahead. Keep reading CN!

COMPUTER PRESS

Compiled Higher and Higher...

SuperSoft's new and **improved BASIC compiler**, version 3.0, is said to be closely compatible with the industry standard BASIC interpreter sold by Microsoft and IBM. Producing fully ROMable code, SuperSoft BASIC lets the user link in assembly or C code, and also produces extremely precise error messages. Available under PC DOS, MS-DOS and CP/M-86, developers can port this BASIC application to all compatible microcomputers.

SuperSoft will update previous versions for $95.00 American, while version 3.0 will retail for three hundred American.

Contact SuperSoft at 1713 South Neil Street, P.O. Box 1628, Champaign, Illinois, 61820, or telephone Stephen Hagler at (217) 359-1212, extension 224.

Circle No. 13 on Reader Service Card

Nantucket Incorporated and *Compuserve* have also developed a **compiler for dBase III**, Clipper, which will initially be offered for the IBM PC and true compatibles, and will list at $953.00 Canadian. Other versions for major 8 and 16bit microcomputers will be forthcoming. coming.

Contact Compuserve at 400 Alden Road, Markham, Ontario, L3R 4C1, telephone (416) 477-8088.

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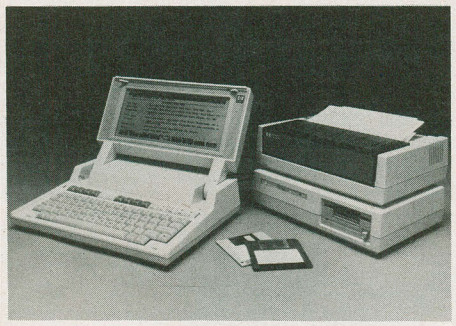

Hewlett-Packard Canada has recently announced the Portable Plus **laptop computer**, an enhanced version of its popular notebook sized portable. Weighing in at just nine pounds, the Portable Plus is battery driven, has a full twenty-five line screen, and can communicate with other computers through an optional built in 1200 baud modem.

Retailing for under four thousand dollars, the Portable Plus is available from Hewlett-Packard Canada, 6877 Goreway Drive, Mississauga, Ontario, L4V 1M8, telephone (416) 678-9430.

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dB Compiler

Version 1.1 of **dBIIICompiler** was released recently by *WordTech Systems*, completing the compiler's implementation of the dBASE III language and making it compatible with any MS-DOS machine. Supporting the use of dBASE III report forms, dBIIICompiler offers full support for generic MS-DOS, allowing a programmer to produce any code for any MS-DOS machine. WordTech Systems will ship version 1.1 free of charge to all registered owners of 1.0, which was introduced in May of this year.

For more information, contact Michael Gardner, Director of Development, WordTech Systems, P.O. Box 1747, Orinda, California, 94563, telephone (415) 254-0900.

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Business Graphics

SoftKey Software Products has announced that the popular KeyChart business graphics program is now available for operation on the Apple II, IIc and IIe. Claimed to be the only **Apple compatible business graphics program** with on screen page layout preview capabilities, KeyChart supports any plotter currently available in North America.

At $495.00 Canadian, it's available from SoftKey Software Products, 411 Shaw Sreet, Toronto, Ont., M6J 2X4, telephone (416) 530-1931.

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Backing Up

The *Irwin* BACKUP tape subsystem, developed to provide **security for hard disk data**, allows two back up methods, the quick and easy Image program of total disk copy, and the more flexible File Interchange program. With its own self-contained power supply, the BACKUP units are compatible with the IBM ATs and XTs and compatibles.

For more information on the Irwin tape subsystems, and prices, contact Kaytronics, 331 Bowes Road, Unit 1, Concord, Ontario, L4K 1J2, telephone (610) 492-2381.

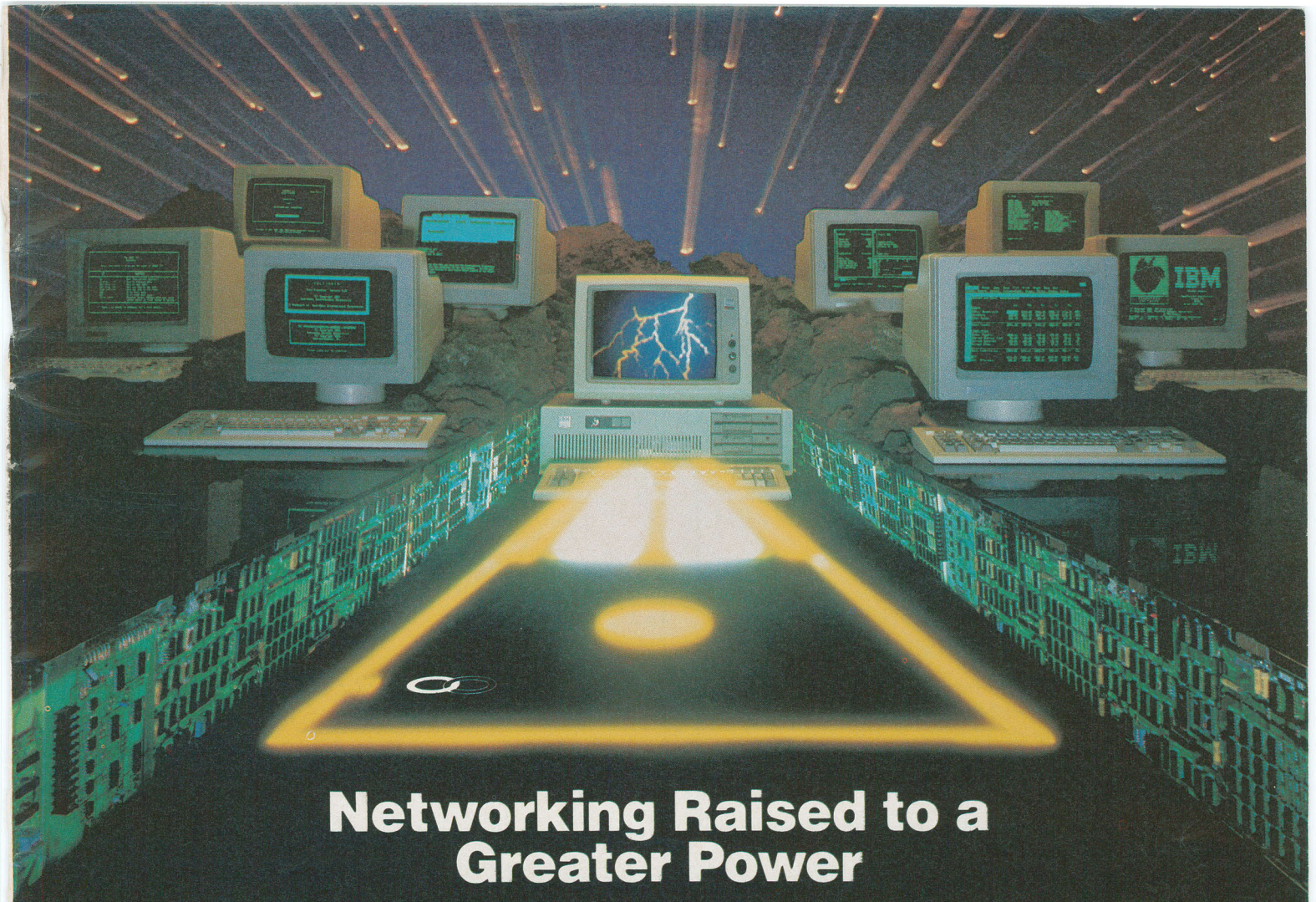
Circle No. 54 on Reader Service Card.

Circle No. 40 on Reader Service Card.

Apple Driver's Seat

Tymac Controls has introduced the **MDD-640 Micro disk drive** exclusively for use with Apple II, II+ and IIe computers. The storage capacity is up to four and a half times that of the standard Apple drive, and uses three and a half inch micro floppies. The unit retails for around four hundred dollars American.

Tymac Controls Corporation, 127 Main Street, Franklin, New Jersey, 07416, telephone (201) 827-4050.



Networking Raised to a Greater Power

Advanced Technology. With it, IBM tripled the speed of the PC and increased its memory capacity five-fold. Nowhere is this increase in computing power more important than in networking situations. If the AT's technological advances have prompted you to look into a multi-user network, you owe it to yourself to take a closer look at MultiLink Advanced™ . . . a unique multi-tasking, multi-user networking system that runs programs under PC-DOS 3.0.

Eight Workstations for the Price of an AT. MultiLink Advanced™ represents the next generation in networking systems for IBM microcomputers. The system enables terminals, connected to a single AT, to emulate IBM-PC's having up to 448K of RAM (The PC-Shadow™ terminal, shown above, even has a PC look-alike, as well as work-alike keyboard and display).

This means that instead of spending $3,000 per workstation for a PC with a Kilobuck "Network Interface Board," you can use inexpensive terminals . . . eight of which cost less than an IBM AT. Even if you need only one workstation connected to your AT, you'll realize significant savings.

MultiLink Advanced™ . . . Instant Access to All of Your Resources. Central to most multi-user situations is the need to coordinate a variety of printers. With what's been described by *PC-Tech Journal* as ". . . by far, the best print spooler for the IBM PC," MultiLink Advanced™ gives users the option to print either at their workstations, or at a central location. In addition, programs and files can be shared by multiple users locally or through use of a modem. Just think of it . . . having remote access to an AT with a lightweight terminal/modem.

Although designed to take advantage of the AT, MultiLink Advanced™ runs on all versions of PC-DOS, except 1.0, and certain implementations of MS-DOS. A wide range of leading programs are supported which include WordStar, dBASE III, Multimate, and Lotus 1-2-3.

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Dealer Inquiries Invited

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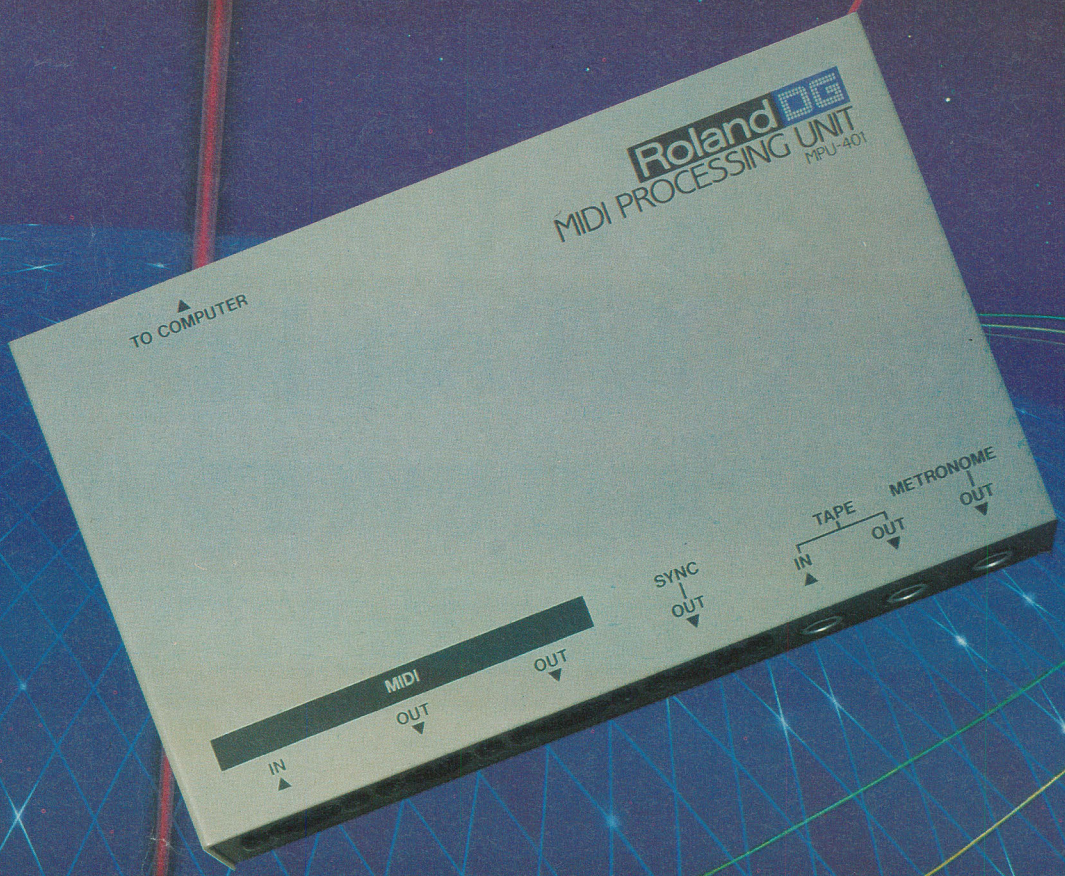

MUSIC and COMPUTERS

MPU-401 MIDI PROCESSING UNIT

For the discriminating musician — the intelligent interface. The **MPU-401** is designed with speed and efficiency in mind. Why tie up your computer when the **MPU-401** will process MIDI data and perform functions while you continue to work with the computer.

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For specific tasks a "dedicated computer" is ideal. **(eg. our Roland MSQ series MIDI Recorders)** These can be designed with certain specifications and applications in ROM, as well as in mind... **portability and ease of use** to name two!

MICRO-COMPUTERS

The power of these computers is the flexibility of their software. MIDI recording, music scorewriting, synthesis, study **(eg JUNO-106 graphics software)** word processing, spreadsheet or graphics, are all common needs for a micro computer. That is why Roland does not dictate which to buy, rather that the **MPU-401** interface and specifications are available for all to use and attach to the computer software of **your choice.**

*For further details, brochures, specifications on the MPU-401 or the largest lineup of MIDI products in the world please contact:

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